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MANUAL
OF
POLICY, PROCEDURES AND GUIDLINES
FOR
ONSITE SEWAGE SYSTEMS

Referring to
Ontario Regulation 374/81
Under Part VII of the
Environmental Protection Act

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PRIVATE SEWAGE DISPOSAL SYSTEMS

Referring to
Ontario Regulation 374/81
under Part VII of the
Environmental Protection Act

MINISTRY OF THE ENVIRONMENT
135 ST. CLAIR AVENUE WEST
TORONTO, ONTARIO
M4V 1P5

MAY 1982

FOREWORD

The contents of this Manual are based on the governing legislation and regulations, principally Part VII of the Environmental Protection Act, which may be referred to elsewhere in the text as the EP Act, or the Act, and Ontario Regulation 374/81, elsewhere referred to as O.Reg. 374/81 or the Regulation, and its amendments. Should there be conflict between the contents of this Manual and the various acts and regulations, as amended, the acts and regulations will govern.

The Manual is issued under the authority of the Minister of the Environment to set down the policy of the Ministry with respect to private sewage disposal, together with related procedures and guidelines.

The policy and the procedures should be considered as statements supplemental to the EP Act and the Regulation. It is expected that the intent of these policies and procedures will be followed by all persons having authority to administer the private sewage program, either directly within the Ministry, or under the terms of agreements between municipalities and the Crown, so that all parts of the Province will be served on an equal basis. The detail of procedures may be varied, but this should be only to the degree necessary to meet local circumstances, and the basic requirements of the Act cannot be omitted. For example, the forms and procedures outlined in the Manual for the application for, and issue of, a Certificate of Approval, may be developed by a Health Unit to suite its administrative processes, but there must be a Certificate of Approval and it should advise an applicant of his right of appeal.

The guidelines included in the Manual cover most matters related to private sewage disposal including technical data, methods, formulae, design standards, etc. They should be used by agencies administering activities under Part VII of the Act, unless local conditions require otherwise, to ensure a common approach throughout the Province. The guidelines will be expanded or modified as required and as technology advances.

The format of the Manual has been selected to permit ease of amendment or addition. The basic part is the Article. Pages are numbered consecutively through each Article, as are Tables, Drawings and Appendices. Chapters are significant only in that they bring together Articles of similar subject

matter. A reference to content in the Manual may be made in an abbreviated form. Examples for the reference to clause (a) (ii) of Section 4 of Article 2 of Chapter 6 would be 6.2.4(a) (ii) or, if in the same Article, "4(a) (ii)” only would suffice. Article 4 of Chapter 6 may be referred to as Article 6.4.

Appendices and drawings, referred to in an article, are found at the end of the Article, e.g. Appendices 6.2.1, 6.2.2, etc., and Drawings 6.2.1, 6.2.2, etc., are those in Article 2 of Chapter 6. The abbreviations "App." for Appendix and “Dwg" for drawing may be used.

In order that the Manual will best serve its purpose, those who use it are requested to draw attention to any inconsistencies, inaccuracies or conflicting statements in the Articles, and should feel free to criticize the contents should their application be impractical, or should better ways be found to achieve the requirements of the Act and the Regulations. All recommendations for change should be forwarded to the appropriate District or Regional office of the Ministry, and reviewed within the Region before submission to the Director, Pollution Control Branch.

A recommendation for addition or change other than the correction of an obvious error, should include a statement of need which clearly documents the reason the existing policy, procedure or guideline is unsatisfactory, and which sets out the proposed addition or change in the manner intended by its proposer. On receipt of recommendations, proposals will be reviewed as to their application throughout the Province and, if necessary, may be referred to the Advisory Committee on Private Sewage Disposal Systems. If any obvious errors are noticed the Director, Pollution Control Branch, should be advised directly.

Distribution of this Manual and its amendments will be:

(a) An official copy to all offices implementing work under Part VII of the Act, or having a direct interest in such activities. These office copies should remain in the office and, it is suggested, a member of the office staff should be assigned to keep the copy up-to-date. These copies will be in the form of a 4 ring loose-leaf binder.

(b) A working copy to all members of those offices who are actively undertaking the work. These copies will be in acco-press-type binders for ease of handling.

(c) Amendments will be forwarded to the offices concerned in sufficient copies to supply individual holders as well as the office copy. It will be the responsibility of holders of working copies to ensure that their Manuals are kept up-to-date.

(d) It is not intended that copies of the Manual will be distributed to the public, although its contents are not confidential. For organizations or individuals wishing to purchase a copy of the Manual, it will be on sale in the Ontario Government Book Store, 880 Bay Street, Toronto. Alternatively, if only port-ions of the Manual are of interest they may make copies for their retention from those held by any administering agency.

The month and year of issue will be marked on the top left of each page, e.g. May/82 which will denote a page issued during May of 1982. Amendments may be in the form of corrections to errata. They may also be page replacements or a complete replacement of an Article, in which case the month and year of issue of the amendment will be shown at the top left of the replacement page.

MAY 1982

MANUAL OF POLICY, PROCEDURES AND GUIDELINES
FOR
PRIVATE SEWAGE DISPOSAL SYSTEMS

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JULY, 1984

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CHAPTER 1

ACTS, REGULATIONS AND REGULATIONSHIPS

CHAPTER 1

ACTS, REGULATIONS AND RELATIONSHIPS

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RELEVANT ACTS AND REGULATIONS

1 GENERAL

The purpose of this article is to review in outline the various acts and regulations which have an impact on the work of an inspector in the field of private sewage disposal systems. An act may be defined as a statute or law passed by a legislative body, while regulations are directions made under authority of the act so that the provisions of that act may be carried out. Changes to an act or to regulations can only be made by legislative authority.

2 THE ENVIRONMENTAL PROTECTION ACT

(a) This Act provides for the protection and conservation of the natural environment. Together with the Ontario Water Resources Act, which is dealt with below, it provides the principle basis for the authority of the Ministry of the Environment.

(b) The Environmental Protection Act gives the Minister of the Environment certain direction and powers. Parts of the Act deal with the management of air quality, solid waste disposal, water, motor vehicles, sewage systems, litter and spills. It also establishes an appeal system as well as defining and assigning authority of Directors and provincial officers.

(c) This manual concerns itself only with Part VII of the Act and related regulations. Section 62 of the Act defines the sewage systems that are subject to Part VII, and the Regulation classifies them as follows:

   (i) Class 1 - a chemical toilet, an incinerating toilet, a recirculating toilet, a self-contained portable toilet and all forms of privy including a portable privy, an earth pit privy, a pail privy, a privy vault and a composting toilet system.

(ii) Class 2 - a leaching pit
(iii) Class 3 - a cesspool
(iv) Class 4 - a septic tank system
(v) Class 5 - a sewage system which requires or uses a holding tank for the storage or retention of hauled sewage at the site where it is produced prior to its collection by a haulage system;
(vi) Class 6 - a sewage system in which sewage is treated in a proprietary aerobic sewage treatment plant.
(vii) Class 7 - a hauled sewage system for the collection, transportation and disposal of hauled sewage including the land used for disposal.
(viii) Class 8 - a sewage system in or on any vehicle except when it is used as part of - a hauled sewage system.
(ix) Class 9 - a sewage works located in whole or in part in or on land on the title of which has been registered in the proper land registry office an instrument referred to in Section 13 of the Ontario Water Resources Act granting, creating or containing a right or interest in, over, above, upon, across, along, through, under or affecting any land or any covenant or condition relating there to affecting the construction, installation, establishment, enlargement, extension, alteration, operation, maintenance, cleaning, emptying or disinfection of the sewage system.

3 ONTARIO WATER RESOURCES ACT (OWR ACT) This act provides for:

(a) The approval, construction, operation and maintenance of water works and sewage works.

(b) The supervision and examination of all surface and ground waters in Ontario in order to control pollution of these waters.

(c) The regulation of the taking of water and the licensing of well drillers.

(d) Sewage works for the disposal of sewage by distribution on the surface of the ground.

(e) The inspection of plumbing installations which, as of April 1, 1974, is under the direction of the Ministry of Consumer and Commercial Relations.

4 THE OWR ACT DOES NOT APPLY TO THE FOLLOWING:

(a) A water works not capable of supplying water at a rate greater than 50,000 litres per day.

(b) A privately owned water works to be used to supply water only for five or fewer private residences.

(c) A sewage works from which sewage is not to drain or be discharged directly or indirectly into a ditch, drain …..or watercourse.

(d) A privately owned sewage works serving only five or fewer private residences.

(e) Some other situations mentioned in section 24(6) of the Ontario Water Resources Act.

5 THE HEALTH PROTECTION AND PROMOTION ACT, 1983

Under this Act, the Ministry of Health has broad powers and duties in relation to public health. Areas of responsibility include drainage, water supply and disposal of garbage and excreta. Prior to the coming into force of Part VII of the Environmental Protection Act, approval of private sewage systems was delegated to the Medical Officers of Health under the authority of the previous Public Health Act. The Ministry of Health retains the authority to protect the health of the public and the Health Protection and Promotion Act provides authority for those administering the Act to order corrections to sewage systems and, if necessary, enforce such orders by legal action.

6 THE TOURISM ACT

Regulation 390/72 made under this Act which promotes tourism in Ontario, provides for the licensing of tourist establishments which include tent and trailer parks, cottage and cabin establishments, lodges and similar tourist accommodation.

7 THE PLANNING ACT

This provides for the orderly development and control of land. It deals with official plans, the subdivision of land, restricted area and building by-laws, Land Division Committees and Committees of Adjustment.

8 THE DRAINAGE ACT

This Act covers drainage works necessary to control the water table within agricultural lands or to regulate the level of waters. It also deals with the improving of a stream, creek or watercourse as well as the obstruction of any drainage works. Section 83(1) of the Drainage Act states:

“Except as authorized by a by-law of the initiating municipality approved by the Ministry of the Environment, no person shall discharge or deposit or permit to be discharged or deposited into any drainage works any liquid, material or substance other than unpolluted drainage water."

9 THE PUBLIC LANDS ACT

Under this Act the Ministry of Natural Resources is responsible for the management, sale and disposition of public lands and forests.

10 AGRICULTURAL CODE OF PRACTICE - ONTARIO PUBLICATION #5000

This publication has been prepared by the Ministry of the Environment and the Ministry of Agriculture and Food. It deals with the establishment of new livestock buildings, renovation or expansion of existing buildings and utilization of-animal manure. It outlines several key measures which, if incorporated into the design of facilities, could minimize air and water pollution problems.

11 FEDERAL ACTS

Various federal departments and the Acts they administer relate to activities which are of interest to those administering the private sewage program. Some of these are:

(a) The Canada Shipping Act. - Under the Coastguard Division of Transport Canada this Act governs domestic and foreign commercial shipping. This, for example, would include fishing boats on the Great Lakes.

(b) The Navigable Waters Protection Act. - Administered by Transport Canada is concerned with work's undertaken or proposed in navigable waters. The Department of Public Works reviews any proposed designs for Transport Canada.

(c) Fisheries and Oceans. - There is a Fisheries Act providing for the control of fisheries and there is enabling legislation, administered by the Small Craft Harbours Branch, for the control of some 380 small craft habours in Ontario.

(d) Environment Canada. - Under this Ministry there is an organization called the Environmental Protection Service (EPS) which has a responsibility for the development and enforcement of federal environmental protection regulations, codes, etc. used to implement federal environmental legislation. It is the policy of the EPS to consult and maintain close liaison with provincial governments across the country.

RELATIONSHIP WITH OTHER MINISTRIES/AGENCIES

1 GENERAL

In Article 1 of this Chapter, a general outline of relevant acts was given. It is apparent that, to carry out its work, the Ministry of the Environment must have liaison with other Ministries, agencies and organizations. In addition to those jurisdictions which are mentioned in Article 1, situations will arise that require similar relationships to be established and maintained with local and regional municipalities, agencies and associations.

2 THE MINISTRY OF MUNICIPAL AFFAIRS AND HOUSING

(a) The Planning Act is the basis for municipal land use planning and the approval process for consents and plans of sub-division. The Minister of Municipal Affairs and Housing is the approval authority for official plans and their amendments as well as plans of subdivision and condominium. These approval powers have and will continue to be delegated to eligible councils requesting them.

(b) In Northern Ontario, the Planning Act also assigns the Minister and the councils of the Regional Municipality of Sudbury and four cities (North Bay, Sault Ste.Marie, Thunder Bay and Timmins) the power to approve consents. The Minister can delegate this power to eligible local councils and planning boards. Councils assigned consent-granting power and those delegated this power, can delegate it tc a committee of council, a committee of adjustment or an appointed officer.

(c) For consent applications in Northern Ontario made to the Minister or his delegate, appeals to the Ontario Municipal Board can be made regarding the entire decision or one or more conditions attached to the approval of the consent. However, appeals by any person or agency of the entire consent decision must be made before the written notice of decision is given to the applicant. Further, appeals of conditions imposed or to be imposed on a consent approval can only be made by the landowner, the local municipality or the county, regional, district or metropolitan municipality up to one year after the date of the written notice of decision.

(d) In Southern Ontario, the consent approval power is assigned to the councils of regions, counties, cities outside regions and separated towns. This power can be delegated by an assigned county or regional municipality to a committee of council, land division committee, an appointed officer or, with the Minister's approval, to a local council. Local councils assigned or delegated consent approval power can further delegate it to a committee of council, a committee of adjustment or an appointed officer.

(e) In Southern Ontario, a consent decision may be appealed to the Ontario Municipal Board within thirty days of the date of the decision by the applicant, the Minister of Municipal Affairs and Housing and every agency or person to whom notice of the decision was sent. The appeal may relate to the entire decision or to one or more conditions attached to the approval of the application. The Planning Act requires that notice of the decision be sent to the applicant, every agency conferred with that requested this notice in writing and anyone else who, in writing, requested this notice.

(f) Applications under the Planning Act for consents, subdivision, minor variance and condominium are circulated for comment to the authority under Part VII the Environmental Protection Act, unless the person to whom the application is made determines that the application will not affect any existing or potential sewage system, or require a new sewage system, or unless the land in the application is, or is to be, serviced by a sewage works approved under the Ontario Water Resources Act.

3 MINISTRY OF HEALTH AND HEALTH UNITS

(a) In almost all areas of the Province, responsibility for Part VII of the Act has been delegated to the health units under agreements signed between the Crown and the local Board of the Health Unit or, in some cases, the Regional Municipality. An exception exists in areas where there is no agreement in effect and the Ministry of the Environment carries out these activities.

(b) There is a need for a close and effective relationship between the Ministry's Regional and District offices and the local municipal authorities (primarily the health units) This is necessary not only in relation to activities under Part VII of the Act, but because there is considerable interrelationship between these activities and other environmental work for which the Ministry has a responsibility.

4 MINISTRY OF INDUSTRY AND TOURISM

(a) Proposals for development of tourist establishments are submitted to the Ministry of Industry and Tourism. The Ministry of the Environment and the agency administering the program under Part VII are requested to comment on each proposal which involves a private sewage system. The procedure for assessment of such a proposal is outlined in the Chapter on "assessment of land".

(b) During the course of a sanitary survey, or the investigation of a complaint, it may be found that a tourist establishment, licensed by the Ministry of Industry and Tourism, has a deficient sewage system. If the operator fails to take corrective action, the Ministry of Industry and Tourism can assist those responsible for administering Part VII activities by suspending or refusing to renew the operator's licence until the corrections are made.

5 MINISTRY OF NATURAL RESOURCES

(a) A plan of subdivision of public lands, prepared by the Ministry of Natural Resources, is submitted to the Ministry of Municipal Affairs and Housing, and is circulated to other ministries and health units for comment. The procedure for assessment of such a proposal is in the chapter on "assessment of land".

(b) The Ministry of Natural Resources may lease or sell Crown Land for various purposes such as the construction of cottages. The property will be assessed by the Health Unit, N.O.P.H.S. or Ministry inspector who will, if appropriate, issue a Certificate of Approval and Use Permit in accordance with Chapter 3, Articles 3 and 4. The Ministries of Environment and Natural Resources have agreed to the use of privies with new construction on lots which are established under the Cottage Lot Program. Conditions may be included in the lease or sale concerning the need to upgrade the sewage system if improvements are made to the cottage that would require such action.

(c) If a pollution problem exists at an establishment on leased Crown Lands, and the owner does not take measures to abate the problem, the Ministry of Natural Resources can assist by enforcing, or threatening to enforce, the conditions of the lease.

(d) It should be noted that the Ministry of Natural Resources, as well as the Ministry of the Environment, will comment on proposals for private development of land around lakes, or adjacent to public lands, which may be affected by the development. In certain cases, it may be desirable for Ministry of the Environment inspectors to discuss the implications of the proposed development with Ministry of Natural Resources staff.

(e) Under the Conservation Authorities Act, local Conservation Authorities are established by the Provincial Government and are assisted by the Ministry of Natural Resources, both technically and financially. While the staff of the Ministry of the Environment will have only limited contact with these Authorities, occasional requests for advice may be received. Local Conservation Authorities are a source of information on flood plains, which may be required in the assessment of land development proposals. Direct liaison between health units and the local Conservation Authority will also take place.

6 COMMITTEES OF ADJUSTMENT

If a municipality has a zoning by-law, the Council may establish a Committee of Adjustment to grant minor variances from the provisions of the zoning by-law. When an official plan is in force the Committee can also grant consent to certain land transactions such as the creation of single new lots, the sale of parts of lots, mortgages and long-term leases. Applications for consent to sever land are sent for comment to various ministries and agencies including the Ministry of the Environment.

7 THE ONTARIO MUNICIPAL BOARD

Under the Municipal Act, the Ontario Municipal Board has jurisdiction and power to hear and determine all applications and matters brought before it under various acts, and to make such orders and regulations, and issue certificates, etc., as may be necessary. Decisions of planning authorities may be appealed to the Ontario Municipal Board as noted in Section 2 of this Article. In the event of such an appeal, it might be necessary for field staff to appear before the Board to give evidence.

8 ENVIRONMENTAL APPEAL BOARD

The Environmental Appeal Board is established under the Environmental Protection Act to hear an Appeal against a decision or written order issued by the Ministry'or by a municipality (e.g. Health Unit) acting under the terms of an agreement with the Crown relating to Part VII of the Act. Causes for appeal under Sections 65, 67 and 69 of the Act are when a Director,

- (a) refuses to issue a certificate of approval;
- (b) suspends or revokes a certificate of approval;
- (c) imposes, alters or revokes terms and conditions in a certificate of approval;
- (d) refuses to issue a permit;
- (e) refuses to issue or renew a licence;
- (f) suspends or revokes a licence;
- (g) imposes, alters or revokes terms and conditions in a licence.

2

CHAPTER 2

CHAPTER 3

CONTROLES – POLICY AND PROCEDURES

CONTROLS - POLICY AND PROCEDURES

CONTROLS GENERAL

1 The EP Act and associated Regulations institute a method of control of Licences, Certificates of Approval, Use Permits and Fees. Procedures must be developed whereby the application is handled expeditiously from an administrative and technical point of view. This Chapter includes as Articles 2, 3 and 4, guidelines dealing with forms and procedures for Licences, Certificates of Approval and Permits. Each Regional, District Office and Health Unit will have the same general procedures with minor variations resulting from local conditions.

2 Appendix 3.1.1 is an information sheet which can be used as a guide to obtain a Certificate of Approval for a Class 2-6 sewage system and a Use Permit for a Class 4-6 sewage system and should be provided to applicants by the local office. If this sheet does not fully meet the needs of the area concerned, additional information may be developed by the Director for issue to applicants in his area.

3 The forms and procedures outlined in this Chapter have been designed to meet the requirements of the Act and the Regulations and to ensure that the information obtained as a basis for approval, and the record of approvals and refusals maintained by each Director, are consistent. For any functional area within Part VII of the Act which is administered through agreement by a Director not employed by the Ministry, the Director may use the forms and procedures outlined herein, or may use local forms and procedures in his area of jurisdiction. Local forms must be as consistent with the requirements of the Act and the Regulations as those in this guideline and provide a comparable record of program delivery. They must include a distinct Certificate of Approval, with advice to the Applicant concerning his or her right of appeal, and a Permit. A record of the details of the installation, including type of tank and pipe, and any changes accepted in the layout and design as installed in relation to that approved in the Certificate, should be recorded on the Permit or kept on file.

Ministry of the Environment
Ontario

INFORMATION FOR INSTALLERS OF SEWAGE SYSTEMS
Classes 1-6 inclusive

1. Reference to the Act and Regulation hereunder refers to the Environmental Protection Act and related Regulation 374/81.
2. **Classification of Private Sewage Systems** — The Regulation classifies systems as follows:—
   (a) **A Class 1 systems** is used only for the disposal of human body wastes and includes a chemical toilet, an earth pit privy, composting privies, an incinerating toilet, a pail privy, a privy vault and a recirculating toilet.
   (b) **A Class 2 system** or leaching pit is used only for the disposal of sewage other than human body wastes.
   (c) **A Class 3 system** or cesspool receives or is used for the disposal of the contents of certain Class 1 systems.
   Notes:—
   (i) A residence served by a Class 1 system will require a separate sewage system for disposal of water-borne wastes from the kitchen, washbasins, baths, showers and laundry. When the water system is not pressurized this disposal may be to a Class 2 system. Waste water from any fixtures connected to a pressure water system is to be disposed of in a Class 4, 5 or 6 system.
   (ii) Premises served by a chemical toilet, a pail privy, a privy vault or a recirculating toilet will require either a cesspool for on-site sewage disposal or the availability of a hauled sewage disposal system.
   (d) **A Class 4 system** consists of a septic tank and a leaching bed.
   (e) **A Class 5 system** consists of a holding tank for the storage or retention of sewage.
   (f) **A Class 6 system** consists of a proprietary aerobic sewage treatment plant and a leaching bed. An application for a Class 6 system must be submitted to the Ministry of the Environment or, where covered by the agreement, to the municipality.
3. **A Certificate of Approval**, under Section 64 of the Act, is required for all Class 2-6 systems inclusive. A Class 1 system is exempt from the Certificate but the standards of construction in the Regulation and Guidelines apply.
4. **A Use Permit**, under Section 67 of the Act, is required for Class 4, 5 and 6 systems before a system can be operated.
5. If installed by anyone other than the lot owner, the installer must hold a licence issued by the Ministry of Environment.
6. **Procedure** —
   (a) **Step 1.** Contact the local office for information related to your proposal and your application form.
   (b) **Step 2.** If a Certificate of Approval is required complete the application form. Note that:
   (i) In the case of most commercial systems the details (calculations, drawings, etc.) required to support the application should be determined from the local office. (Items 5 and 7 on the application form). Discussion with the office on the quantity and nature of sewage from commercial operations is advisable before submitting the application.
   (ii) Item 6: — Water Supply — Bored wells are excavated by augering to remove the soil. Casings are normally not watertight. e.g. concrete title. Drilled wells are sunk by drilling inside a casing through which the spoil is removed as a liquid slurry. They are normally deeper and smaller in diameter and in a watertight casing, usually steel pipe.
   (iii) Item 7:— Attach and list the following:
   If a Class 5 system — a copy of the pump-out contract.
   If a Class 6 system — details of the servicing option under the regulation.
   If a Commercial Establishment — details as required by the local office.
   (iv) ATTACH A CHEQUE OR MONEY ORDER FOR THE REQUIRED FEE PAYABLE TO THE TREASURER OF ONTARIO OR THE MUNICIPALITY AS APPLICABLE.
   (v) Forward the completed application form to your local office.
   (c) **Step 3.** Carry out the following work before your lot is inspected:
   (i) Post the completed Lot Identification card where it can be seen from the point of access to your lot.
   (ii) Clearly mark the corners of your lot.
   (iii) Mark any property boundaries that may be close to the proposed sewage system.
   (iv) Stake out the area you propose for your leaching bed and excavate two test pits to a minimum depth of 1.5 metres (or at least to rock or water table). Locate pits well separated to give overall indication of soil conditions in the leaching bed area and to disclose most adverse conditions. About 1.5 metres of pervious soil is required over rock, water table, or soils of insufficient permeability for an in-ground leaching bed.
   (v) Arrange for an inspection date and time with the local office.
   (d) **Step 4.** After your lot is inspected, if it is found suitable, or if it can be made suitable for the system proposed, a Certificate of Approval will be issued. If found unsuitable you may wish to discuss alternatives with the local office. DO NOT CONSTRUCT WITHOUT A CERTIFICATE OF APPROVAL.
   (e) **Step 5.** If a Building Permit is required, take your Certificate of Approval to your local municipal office and obtain the Building Permit.
   (f) **Step 6.** Install the sewage system or have it installed by a licenced contractor. Note that the trenches or other parts must remain open and cannot be covered or backfilled until inspected. When this stage is reached, contact the local office and arrange for the site inspection for your Use Permit. Forty-eight hours' notice should be given to the inspecting office to arrange for final inspection.
   (g) **Step 7.** After final inspection, if properly installed, only backfill and finishing work will remain, and a Use Permit will be issued for your system. If corrective work must be undertaken the Inspector will so advise. NOTE THAT IT IS AN OFFENCE UNDER THE ENVIRONMENTAL PROTECTION ACT TO USE YOUR SYSTEM WITHOUT A USE PERMIT.
7. **Approval from the Ministry of Transportation and Communications (MTC)** may be required for the installation of sewage systems or parts thereof within limited distances of the right-of-way of Provincial highways (Sec. 34 and 38 of the Public Transportation and Highway Improvement Act). Applicants in these circumstances should clear their proposals with the local MTC office.
8. **Appeals.** Under Section 121 of the Act an applicant has the right to appeal a decision where a Certificate of Approval or a Use Permit is refused by a Director or is issued conditionally and the Director must advise the applicant in writing of the reasons for the refusal or the imposition of conditions. Notice of appeal must be served on the Director and the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ont. M4V 1K7 within 15 days of receipt of the decision.

Ministère de l'Environnement
Ontario

RENSEIGNEMENTS DESTINÉS AUX INSTALLATEURS DE SYSTÈMES D'ÉVACUATION DES EAUX USÉES
Classes 1 à 6 comprise

1. Les références ci-dessous à la loi et aux règlements concernent la Loi de 1971 sur la protection de l'environnement et le Règlement 374/81 y afférent.
2. **Classification des systèmes privés d'évacuation des eaux usées** – Le règlement classe ces systèmes de la façon suivante:
   a) **Un système de classe 1** est destiné uniquement à recevoir les déchets humains. Cette classe comprend les cabinets chimiques, à puits perdu, à compostage, à incinération, à cuvette, à fosse et à recirculation.
   b) **Un système de classe 2** ou puits absorbant est destiné seulement à recevoir les eaux usées autres que les déchets humains.
   c) **Un système de classe 3** ou fosse d'aisance est destiné à recevoir ou à collecter le contenu de certains systèmes de classe 1.
   Remarques:
      i) Une habitation desservie par un système de classe 1 aura besoin d'un système d'évacuation distinct pour les eaux usées de cuisine, d'éviers, de baignoires, de douches et de buanderie. Lorsque le système d'alimentation d'eau n'est pas pressurisé, l'évacuation peut se faire avec un système de classe 2. Les eaux usées rejetées par tout appareil branché à un système d'alimentation d'eau sous pression doivent être évacuées dans un système de classe 4, 5 ou 6.
      ii) Les locaux desservis par un cabinet chimique, à cuvette, à réservoir, à recirculation doivent être dotés soit d'une fosse d'aisance pour l'évacuation sur place des eaux usées, soit d'un système d'enlèvement par camion.
   d) **Un système de classe 4** comporte une fosse septique et un lit de filtration.
   e) **Un système de classe 5** comporte un réservoir d'accumulation des eaux usées.
   f) **Un système de classe 6** comporte une installation privée de traitement aérobie des eaux usées et un lit de filtration. Toute demande relative à un système de classe 6 doit être soumise au ministère de l'Environnement ou, dans le cadre de la convention, à la municipalité.
3. **Un certificat d'approbation** est exigé en vertu de l'article 64 de la Loi pour les systèmes de classe 2 à 6 incluse. Un système de classe 1 ne nécessite pas de certificat mais doit se conformer aux normes de construction du règlement et des directives.
4. **Un permis d'utilisation** est exigé en vertu de l'article 67 de la Loi pour les systèmes de classe 4, 5 et 6 avant leur mise en service.
5. Si un système est installé par quiconque autre que le propriétaire de la parcelle, l'installateur doit être titulaire d'un permis délivré par le ministère de l'Environnement.
6. **Marche à suivre** –
   a) **Étape 1.** Se mettre en rapport avec le bureau local pour tout renseignement sur le projet et la formule de demande.
   b) **Étape 2.** Si un certificat d'approbation est exigé, remplir la formule de demande. Remarquer que:
      i) Pour la plupart des systèmes commerciaux, il faut déterminer avec le bureau local les renseignements (calculs, dessins, etc.) requis à l'appui de la demande. (Points 5 et 7 de la formule de demande.) Avant de soumettre une demande pour un système commercial, on recommande d'étudier avec le bureau le volume et la nature des eaux des activités commerciales.
      ii) Point 6 – Alimentation en eau – Les puits creusés le sont par enlèvement du sol. Le cuvelage n'est généralement pas étanche (par exemple, dalles en béton). Les puits forés sont réalisés par forage à l'intérieur d'un tubage par lequel les déchets sont remontés sous forme de boue liquide. Ils sont en général plus profonds et d'un diamètre plus petit. Le tubage est étanche, habituellement en tubes d'acier.
      iii) Point 7 – Joindre les pièces suivantes en les énumérant:
         Pour un système de classe 5 – un exemplaire du contrat de pompage
         Pour un système de classe 6 – fournir des détails relativement aux services d'entretien en vertu du règlement
         Pour un établissement commercial – fournir les détails exigés par le bureau local.
      iv) JOINDRE UN CHÈQUE OU UN MANDAT AU MONTANT DU DROIT EXIGÉ, PAYABLE À L'ORDRE DU TRÉSORIER DE L'ONTARIO OU DE LA MUNICIPALITÉ, SELON LE CAS.
      v) Envoyer la formule de demande, dûment remplie, au bureau local.
   c) **Étape 3.** Procéder aux travaux suivants avant l'inspection de la parcelle:
      i) Afficher la carte d'identification de parcelle dûment remplie en un endroit visible du point d'accès à la parcelle.
      ii) Repérer nettement les coins de la parcelle.
      iii) Repérer les limites de propriété pouvant se trouver à proximité du système d'évacuation proposé.
      iv) Jalonner la zone proposée pour installer le lit de filtration et creuser deux tranchées d'une profondeur minimum de 1,5 mètre (ou jusqu'à la roche ou à la nappe phréatique). Les tranchées doivent être suffisamment écartées pour donner une bonne indication globale de la structure du sol au voisinage du lit de filtration et pour mettre en évidence les caractéristiques défavorables. Il faut disposer d'environ 1,5 mètres de sol perméable au-dessus de la roche, de la nappe phréatique ou d'un sol de perméabilité insuffisante pour un lit de filtration souterrain.
      v) Fixer une date et une heure d'inspection avec le bureau local.
   d) **Étape 4.** Si, après l'inspection, la parcelle convient au système proposé ou peut être aménagée à cette fin, il sera délivré un certificat d'approbation. Si le terrain ne convient pas, consulter le bureau local pour étudier les autres solutions possibles. NE RIEN CONSTRUIRE SANS CERTIFICAT D'APPROBATION.
   e) **Étape 5.** S'il faut un permis de construire, présenter le certificat d'approbation au bureau municipal local pour obtenir ce permis.
   f) **Étape 6.** Installer le système d'évacuation ou le faire installer par un entrepreneur titulaire d'un permis. Noter que les tranchées et autres parties du système doivent demeurer à découvert et ne doivent être recouvertes ou remblayées qu'après inspection. Se mettre en rapport avec le bureau local pour faire inspecter le système et obtenir le permis d'utilisation. Accorder quarante-huit heures de délai au bureau d'inspection pour procéder à l'inspection finale.
   g) **Étape 7.** Si l'inspection finale montre que le système est correctement installé, il suffit de procéder aux remblayages et à la finition. Un permis d'utilisation sera délivré pour le système. S'il faut procéder à des modifications, l'inspecteur le signalera. IL FAUT SIGNALER QUE L'USAGE D'UN SYSTÈME D'ÉVACUATION SANS PERMIS D'UTILISATION CONSTITUE UNE INFRACTION À LA LOI SUR LA PROTECTION DE L'ENVIRONNEMENT.
7. **L'approbation du ministère des Transports et des Communications (MTC)** peut être nécessaire en cas d'installation de systèmes d'évacuation des eaux usées ou parties de tels systèmes en deçà d'une certaine distance à l'assise des routes provinciales (articles 34 et 38 de la loi intitulée the Public Transportation and Highway Improvement Act). Les requérants doivent alors soumettre leur projet au bureau local du MTC.
8. **Appel.** En vertu de l'article 121 de la loi, un requérant peut faire appel d'une décision d'un directeur refusant un certificat d'approbation ou un permis d'utilisation ou n'accordant un tel certificat ou permis que sous certaines conditions; le directeur doit indiquer par écrit au candidat les raisons du refus ou des conditions imposées. Un avis d'appel doit être présenté au directeur et à la Commission d'appel sur l'environnement, 1 ouest, avenue St. Clair, Toronto (Ontario) M4V 1K7, dans les 15 jours suivant la réception de l'avis de décision.

(English-See Over)

Ontario

LOT IDENTIFICATION

Name..

Lot No...................

MOE 00-059

Note: - size of the Lot Identification Card is as shown
- Paper is white 8 or 10 point paper coated one side with a red triangle and green logo.
- To be mounted on a post, tree, fence, etc. so as to be visible from the access road and provide the inspector with positive lot identification.

LICENSING - SYSTEM INSTALLERS AND SEWAGE HAULERS

1 GENERAL

(a) Licensing of companies, corporations, and individuals engaged in the business of installing, repairing or altering all or parts of private sewage disposal systems, or in the business of hauling sewage from such systems and disposing of the sewage at some other location, is required under Section 69 of the Environmental Protection Act and Regulation 374/81. This does not preclude any individual from installing, repairing or altering his own system, provided it can be done in accordance with the regulations.

(b) The intent of licensing is to provide a system of control over those who are performing work that is expected to be carried out according to the requirements of the Act and the Regulation. The specific detail of the work is covered in the Certificates of Approval and Operating Permits which are issued. This control is needed because the work is performed almost entirely without direct supervision. The standard of performance of installers can only be assessed at the final inspection, or by spot inspections, or as a result of an investigation of a complaint or a system failure. In the case of haulers, performance is assessed either by spot inspections of their activities, or as a result of complaints. In addition to following the requirements of the Act, the Regulation and the specific approvals given, a licence holder is expected to carry out his tasks in accordance with accepted trade practices and good workmanship.

(c) A Licence is granted to an applicant who meets the requirements of the Act and Regulations, passes an examination if required, and pays any prescribed fees. The powers of a Director to refuse to issue or renew, or to revoke a Licence, are in Section 69(3) of the Act. The authority to issue Licences is vested in a member of the Ministry of the Environment appointed as a Director for that purpose. Section 70 of the Act does not provide for its delegation.

(d) While the issuing, renewing, revoking or suspension of a Licence is a Ministry of the Environment responsibility, the work conducted by the licensees is entirely under the control of the agencies administering the program under Part VII of the Act. This is normally the Medical Officer of Health. Thus, Health Unit personnel will grant Certificates of Approval of all kinds, including those for hauled sewage systems (class 7) and class 6 systems, if authorized by agreement, and all corresponding Permits, including Permits to Operate a class 7 system.

2 REQUIREMENTS FOR LICENCES

(a) CLASS 1 LICENCE - Any person or company who is responsible for the work of installing, repairing or altering all, or parts, of a private sewage disposal system for remuneration must hold a valid class 1 Licence. This does not mean that a contractor or supplier need be licensed if only delivering a septic tank, pipe, sand, crushed stone, etc., to the site, or doing only excavation. It applies to those who are responsible for seeing that the construction, repair or alteration work is done in accordance with the authorization, regulations, etc. If the class 1 licensee intends to repair or service class 6 sewage systems, his Licence must be endorsed, indicating the specific system he is permitted to repair or service, or he must possess the written approval of the licensing Director for such work. The intention to become a licensed service contractor for a class 6 system must be stated on the Application form. Proof of capability (usually a letter from the manufacturer of the system) related to the specific equipment he intends to service should be attached. A person who holds a Licence may obtain this authority by written request to the licensing Director, attaching similar proof.

(b) CLASS 2 LICENCE - All persons or companies engaged in the transportation of sewage from private sewage systems, and the disposal of such wastes, require a class 2 Licence.

(b) Any individual or company engaged in both activities must hold both a class 1 and a class 2 Licence.

(d) It is emphasized that a Licence only entitles the holder to be "in the business" of carrying out the type of activity covered by the licence. It is not an authorization to carry out specific tasks. Except for work on class 1 sewage systems, all installations, alterations, etc., must be authorized by a Certificate of Approval. The holder of a class 1 Licence should not carry out work unless it is properly authorized in this manner, and should carry it out in accordance with the requirements of the Certificate of Approval and the Regulation. A class 2 licence holder must obtain a Certificate of Approval and Permit to Operate covering his activities in each jurisdiction in which the activity is carried out.

3 PROCEDURE FOR OBTAINING A LICENCE

(a) The form at App. 3.2.1 shall be used by all applicants for either a class 1 or class 2 Licence. The Licence form is at App. 3.2.2.

(b) In the case of an applicant proposing to enter the hauling business, information should be obtained as to the equipment he owns and intends to use and on any equipment he intents to purchase for the job. An information sheet similar to that at App. 3.2.3 should be used to indicate the equipment which is available or which it is intended to purchase, rent or construct (e.g. a barge).

(c) Ministry application forms shall be held by all Health Unit and Ministry District offices for issue to applicants.

(d) The original and three copies of completed application forms shall be forwarded to the office administering Part VII, normally the Health Unit, in whose area of responsibility the individual's or company's main base of operations is located.

(e) The Medical Officer of Health reviews the application and records a recommendation for approval or refusal before forwarding the original and one copy to the MOE Regional office. A copy is retained by the Medical Officer of Health. Recommendations for refusal must be substantiated by written reasons.

(f) The MOE Regional office shall review the application, and provide the Director with the original copy together with recommendations for approval or refusal. If the latter, full reasons for this recommendation must be attached. A copy may be sent to the appropriate MOE District office.

(g) If the Director approves the application, a licence will be forwarded directly to the applicant and two copies to the MOE Regional office. The Region should forward one copy to the Health Unit or District office administering Part VII. If the licence is refused, the notice of refusal, with reasons stated, is to be forwarded directly to the applicant, and the applicant shall be advised of his right of appeal. Copies of this notice are to be sent to the Regional office for distribution to the Health Unit or District office as appropriate.

4 TERMS OF LICENCE

(a) It is important that those reviewing applications for a licence determine the actual status of the organization, and ensure that the name or Company designation and the business address are accurate and complete. The licensee should be:

- (i) The individual named on the application if the business is operated under that name.
- (ii) The owner's name if an unincorporated business other than a partnership.
- (iii) The names of all partners in an unincorporated business which is a partnership.
- (iv) The company name in the case of incorporated companies.

(b) A licence is not transferrable.

(c) A licence expires 12 months after the date of issue.

(d) The responsibilities of the licence holder, and extracts from the Act concerning licensing and the right of appeal, are included on the back of both the Application and Licence forms.

(e) The licensing Director may refuse to issue or renew a Licence and may suspend or revoke a Licence under the terms stated in Section 69 (3) of the Act.
(See reverse of Licence form).

5 LICENCE RENEWAL

(a) The office of the Director shall send a new Licence to each licence holder about 30 days prior to the expiration of the Licence unless a case has been established against renewal.

(b) If at the time when a new Licence would normally be forwarded •to a licensee,

(i) a suspension of a Licence is in force, the new Licence shall be issued to be effective at the close of the suspension, but no new application is required;

(ii) the Director has suspended or revoked the Licence, but the period in which the licensee may appeal the decision has not expired, then, persuant to Section 122 (2) of the Act, the licensee is permitted to continue in business until the final disposition of an appeal, even if his Licence would otherwise have expired.

6 FEES

(a) Under Section 136 (5)(i) of the Environmental Protection Act fees may be set by Regulation 374/81 for the issue and renewal of Licences. Any fees so set are payable to the Treasurer of Ontario by cheque or money order.

7 CONDUCT OF WORK BY LICENCEES

(a) The Licence, issued by the Ministry of the Environment, is entitlement to conduct a business while Certificates of Approval and Permits to Operate, issued by the authority implementing Part VII activities, outline and authorize the specific work activities, and are required to cover all activities except the installation of class 1 systems.

(b) The licensees performance will be assessed by the implementing authorities on the basis of his compliance with Certificates of Approval, Operating Permits, his standard of workmanship and, as it may effect his operation from an environmental and health standpoint, the adequacy and condition of the equipment he uses. For example, a small tank truck which may require two trips to empty a holding tank, but which is in good condition, is not a hazard to the environment or public health, although its use may add to haulage costs, but a truck in poor condition, with a pump or valves that leak, is not acceptable. Section 69 (3) of the Act covers the conditions of unsatisfactory operation which could lead to a recommendation that a licence be suspended, revoked or not renewed.

(c) As required by regulation, any change in a partnership or corporation to the particulars shown in the application is to be notified to the Director within 30 days after the effective date of change. Similarly, where it is known that any licensees had gone out of the business, the Region should advise the Director. The licensee should be instructed to send written notice to the Director of his intention to cease operations. Should an individual or corporation cease to be licensed and, at some future date wish to be re-licensed, application for a new Licence must be made.

8 CLASS 1 LICENCES FOR CLASS 6 SYSTEMS

As noted on the Licence form, the holder of a class 1 Licence is not permitted to repair or service a class 6 system unless the Licence has been endorsed by the Director to give the licensee authority to do such work, or the licensee has received written approval. The endorsement, or written approval, must refer specifically to the make and model of equipment on which repair and servicing is permitted, e.g. a Licence endorsed for servicing a household sized unit would not entitle the licensee to repair or service larger and more complicated units made by the same company. Requests for recognition of qualification to service and repair specific class 6 systems may be submitted in writing to the Director at any time during the tenure of the Licence, or may accompany an application for a Licence. Proof of qualifications, normally a letter from the manufacturer, should be attached.

9 ADMINISTRATION OF THE LICENSING PROGRAM

(a) The agency administering Part VII of the Act should maintain a file or record for each licensee whose principal base of operations is in its area of responsibility. This file should hold:

(i) a copy of the Application for Licence.

(ii) a copy of the original Licence and all renewals.

(iii) if it is for a Class 2 licensee, a copy of Applications for Certificates of Approval, Certificates of Approval and Permits issued and any refusals.

(iv) data sheets for equipment holdings if a class 7 sewage system (App. 3.2.3).

(v) correspondence concerning the Licence. This is to include any complaints received by the administering unit from within or outside of their area of jurisdiction (Sec. 10 hereunder), and any observation made by inspection staff on work performance.

(vi) any recommendations and supporting details related to suspensions or revocation or against renewal (Sec. 10).

(vii) copies of the annual report on the operation of a class 7 sewage system required by Ontario Regulation 374/81 clause 13 (3)(c) to be submitted to the Director by the operator of the system by February 1st of each year summarizing the previous years' operation. For this purpose the "Director is the Health Unit or MOE District administering Part VII in the area in which the licensee disposes of the sewage (i.e. the agency authorizing the Certificate of Approval). A licensee may, therefore, be required to submit reports to more than one health unit. If sewage is collected in one agency's area of Jurisdiction, and disposed of in another's, the licensee requires a certificate and permit from each agency, or a single authorization from the agency in whose area disposal takes place endorsed by the agency where the sewage is collected.

10 REFUSAL TO ISSUE OR RENEW A LICENCE AND THE SUSPENSION OR REVOCATION OF A LICENCE

Section 69 (3) of the Environmental Protection Act outlines the powers of the licensing Director. Evidence to support any of these actions must come from the agencies administering activities under Part VII of the Act. As recommendations for non-issue, non-renewal, suspension or revocation of a Licence affect the individual's or the company's livelihood, the evidence should be documented in writing. The most common reasons would be unsanitary practices which offend the Act, poor workmanship and work not performed in accordance with the terms and conditions of Certificates of Approval or without proper authorization. Recommendations of this nature, and the documentation of substantiating evidence, is the responsibility of the Health Unit or MOE District administering Part VII in whose area of responsibility the complaint(s), poor workmanship, or other unacceptable circumstance occurred, whether or not it is the area in which the licensee's principal base of operations is located. The recommendation, plus supporting data, shall be forwarded to the MOE Regional office in the recommending agency's area. A copy should be sent to the MOH or MOE District Officer in whose area the licensee's principal base is located, and that office should be prepared to comment on the licensee's performance in their own area, should the Director for licensing so request after his review of the recommendation. If the Director's decision is to uphold the recommendation, and to refuse to issue or renew a Licence, or to suspend or revoke a Licence, the Director must advise the applicant or licensee of this decision, with written reasons, and of his right to appeal.

MINISTRY USE ONLY

FILE ....

DATE RECEIVED ....

RECEIPT NO. ....

APPLICATION FOR A LICENCE UNDER SECTION 69 OF THE ENVIRONMENTAL PROTECTION ACT

1. APPLICANT: NAME .... TELEPHONE NO. ....

   ADDRESS ....

2. LICENCE REQUESTED FOR:
   — A CLASS 1 LICENCE ☐ FOR CONSTRUCTING ONSITE, INSTALLING, SERVICING, REPAIRING, CLEANING, AND EMPTYING OF SEWAGE SYSTEMS
   — A CLASS 2 LICENCE ☐ FOR HAULING, STORING AND DISPOSING OF SEWAGE FROM SEWAGE SYSTEMS, INCLUDING EMPTYING FOR THESE PURPOSES.

3. ORGANIZATION
   A) PRIVATELY OWNED — CHECK IF OWNERSHIP CHANGED FROM PREVIOUS APPLICATION
   — OWNER'S NAME IF NOT APPLICANT .... TELEPHONE NO. ....
   — ADDRESS ....
   B) INDICATE IF PARTNERSHIP ☐, OR CORPORATION ☐, AND ATTACH LIST OF NAMES AND ADDRESSES OF:
      1) ALL PARTNERS, MEMBERS OR DIRECTORS
      2) ALL PARTNERS, DIRECTORS OR FULL-TIME EMPLOYEES WHO WILL BE IN CHARGE OF SUPERVISING THE WORK
      3) THE OFFICIAL REPRESENTATIVE(S) WHO WILL ENSURE COMPLIANCE WITH THE ACT AND REGULATION

   NOTE: THIS DATA IS REQUIRED BY ONTARIO REGULATION 374/81 SECTION 14(8). CHANGES MUST BE REPORTED TO THE DIRECTOR WITHIN 30 DAYS AFTER THE EFFECTIVE DATE OF THE CHANGE.

4. EQUIPMENT: ATTACH A DESCRIPTION OF THE EQUIPMENT OWNED OR TO BE PROCURED FOR USE IN THIS SYSTEM.

5. AREA OF OPERATION: STATE REGION(S), DISTRICT(S) OR MUNICIPALITY(S) IN WHICH OPERATION IS INTENDED.

6. HAVE YOU EVER PREVIOUSLY APPLIED FOR A LICENCE?.............. IF LICENCE ISSUED STATE NO. ....
   YES OR NO

7. I UNDERSTAND THE CONTENTS OF SECTION 69 AND 121(2) OF THE ENVIRONMENTAL PROTECTION ACT AND THE APPLICANT'S UNDERTAKING PRINTED ON THE REVERSE OF THIS FORM, AND AGREE TO COMPLY WITH THE APPLICANT'S UNDERTAKING.

   DATED THIS .... DAY OF .... 19 ....
   SIGNATURE OF APPLICANT

RECOMMENDATION

9. RECOMMEND ISSUE/REFUSAL OF A LICENCE PER APPLICATION (IF FOR REFUSAL ATTACHED REASONS IN WRITING)

....
(SIGNATURE)

.... (DATE) .... (APPOINTMENT)

....
(OFFICE)

ISSUING OFFICE

9. A) CLASS .... LICENCE NO. .... ISSUED ....
   (DATE)

   B) LICENCE REFUSED FOR REASONS ATTACHED:

   .... (DATE) .... (DIRECTOR)

LICENSING — SECTION 69 — THE ENVIRONMENTAL PROTECTION ACT

WHERE LICENCE REQUIRED

69 — 1) NO PERSON SHALL ENGAGE IN THE BUSINESS OF,
A) CONSTRUCTING ON SITE, INSTALLING, REPAIRING, SERVICING, CLEANING OR EMPTYING SEWAGE SYSTEMS; OR
B) STORING, HAULING OR DISPOSING OF SEWAGE FROM A SEWAGE SYSTEM,
WITHOUT HAVING FIRST OBTAINED A LICENCE ISSED BY THE DIRECTOR.

APPLICATION FOR LICENCE

2) SUBJECT TO SUBSECTION 3, AN APPLICANT FOR A LICENCE WHO,
A) PAYS THE PRESCRIBED FEE; AND
B) MEETS THE REQUIREMENTS OF THE REGULATIONS,
IS ENTITLED TO BE ISSUED SUCH LICENCE BY THE DIRECTOR.

POWERS OF DIRECTOR

3) THE DIRECTOR MAY,
A) REFUSE TO ISSUE OR RENEW A LICENCE; OR
B) SUSPEND OR REVOKE A LICENCE,
WHERE THE LICENSEE IS IN CONTRAVENTION OF THIS ACT OR THE REGULATIONS OR THE LICENSEE IS IN BREACH OF ANY TERM OR CONDITION OF THE LICENCE, OR, WHERE THE DIRECTOR IS OF THE OPINION THAT,
C) THE APPLICANT OR LICENSEE OR, WHERE THE APPLICANT OR LICENSEE IS A CORPORATION, ITS OFFICERS OR DIRECTORS, IS OR ARE NOT COMPETENT TO CARRY ON THE BUSINESS THAT WOULD BE OR IS AUTHORIZED BY THE LICENCE;
D) THE PAST CONDUCT OF THE APPLICANT OR LICENSEE OR, WHERE THE APPLICANT OR LICENSEE IS A CORPORATION, OF ITS OFFICERS OR DIRECTORS, AFFORDS REASONABLE GROUNDS FOR BELIEF THAT THE BUSINESS THAT WOULD BE OR IS AUTHORIZED BY THE LICENCE WILL NOT BE CARRIED ON IN ACCORDANCE WITH LAW;
E) THE APPLICANT OR LICENSEE DOES NOT POSSESS OR WILL NOT HAVE AVAILABLE ALL PREMISES, FACILITIES AND EQUIPMENT NECESSARY TO CARRY ON THE BUSINESS AUTHORIZED BY THE LICENCE IN ACCORDANCE WITH THIS ACT AND THE REGULATIONS; OR
F) THE APPLICANT OR LICENSEE IS NOT IN A POSITION TO OBSERVE OR CARRY OUT THE PROVISIONS OF THIS ACT AND THE REGULATIONS.

4) THE DIRECTOR MAY IMPOSE, ALTER OR REVOKE TERMS AND CONDITIONS IN A LICENCE IN ORDER,
A) TO RESTRICT THE AREA IN WHICH A LICENSEE MAY OPERATE; AND
B) TO CONTROL THE METHOD OR PLACE OR BOTH OF STORING, HAULING, COLLECTING, TRANSFERRING AND DISPOSING OF SEWAGE FROM A SEWAGE SYSTEM.

EXPIRATION OF LICENCE

5) A LICENCE EXPIRES TWELVE MONTHS AFTER THE DATE OF ITS ISSUE OR RENEWAL.

6) A LICENCE IS NOT TRANSFERABLE.

SECTION 121(2) — THE ENVIRONMENTAL PROTECTION ACT

121(2) WHEN THE DIRECTOR,

A) REFUSES TO ISSUE OR RENEW OR CANCELS OR SUSPENDS A LICENCE OR PERMIT;

B) IMPOSES TERMS AND CONDITIONS IN ISSUING A LICENCE OR PERMIT OR CERTIFICATE OF APPROVAL OR PROVISIONAL CERTIFICATE OF APPROVAL; OR

C) ALTERS THE TERMS AND CONDITIONS OF A CERTIFICATE OF APPROVAL, PROVISIONAL CERTIFICATE OF APPROVAL, A LICENCE OR PERMIT AFTER IT IS ISSUED,

THE DIRECTOR SHALL SERVE NOTICE TOGETHER WITH WRITTEN REASONS THEREFOR UPON THE APPLICANT OR THE PERSON TO WHOM THE LICENCE OR CERTIFICATE OF APPROVAL OR PROVISIONAL CERTIFICATE OF APPROVAL IS ISSUED, AS THE CASE MAY BE, AND THE APPLICANT OR PERSON MAY, BY WRITTEN NOTICE SERVED UPON THE DIRECTOR AND THE BOARD WITHIN FIFTEEN DAYS AFTER THE SERVICE OF THE NOTICE, REQUIRE A HEARING BY THE BOARD.

APPLICANT'S UNDERTAKING

I AM AWARE OF THE ABOVE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT AND OF ONTARIO REGULATION 374/81 SECTION 14 WHERE NOTED ON THIS FORM. I AM ALSO AWARE THAT SECTION 14 OF THE REGULATION STATES THAT AN APPLICANT MAY BE REQUIRED BY THE DIRECTOR AUTHORIZED TO ISSUE LICENCES TO PASS AN EXAMINATION ADMINISTERED BY A PERSON DESIGNATED BY THE DIRECTOR PROVIDING THE APPLICANT IS ADVISED BY REGISTERED MAIL OF THE DATE, TIME AND PLACE FIXED FOR THE EXAMINATION AND ANY INFORMATION OR EVIDENCE IN RESPECT OF THE QUALIFICATIONS OF THE APPLICANT TO ENGAGE IN THE BUSINESS THAT THE DIRECTOR MAY REQUIRE HIM TO PRODUCE, AND THAT SUCH NOTICE SHALL BE GIVEN 7 DAYS IN ADVANCE OF THE FIXED DATE. WHERE AN APPLICANT IS A PARTNERSHIP OR CORPORATION THE EXAMINATION, IF REQUIRED, SHALL BE TAKEN BY THE OFFICIAL REPRESENTATIVE (SEE 3(B)(3) OF THIS FORM). I AM ALSO AWARE THAT SECTION14(4) OF THE REGULATION REQUIRES THAT AN APPLICATION FOR A RENEWAL OF A LICENCE SHALL BE MADE AT LEAST 30 DAYS PRIOR TO THE EXPIRY OF THE LICENCE BEING RENEWED.

IF GRANTED A LICENCE, I DO HEREBY UNDERTAKE, AS A HOLDER OF A CLASS I LICENCE, TO ONLY CONSTRUCT, INSTALL, ESTABLISH, ENLARGE, EXTEND OR ALTER A SEWAGE SYSTEM FOR WHICH THERE IS A VALID CERTIFICATE OF APPROVAL AS REQUIRED BY THE REGULATIONS, AND ONLY IN ACCORDANCE WITH THE TERMS OF THAT CERTIFICATE, UNLESS CHANGES ARE AUTHORIZED BY THE DIRECTOR WHO ISSUED THE CERTIFICATE, OR THAT, AS A HOLDER OF A CLASS 2 LICENCE, I WILL ONLY CONDUCT THE OPERATION OF EMPTYING, HAULING, STORING, AND DISPOSING OF SEWAGE FROM PRIVATE SEWAGE SYSTEMS PROVIDING I AM IN POSSESSION OF A CERTIFICATE OR CERTIFICATES OF APPROVAL AND PERMIT(S) TO OPERATE A CLASS 7 SYSTEM WHICH SPECIFICALLY AUTHORIZES THE OPERATION AND MEANS OF DISPOSAL OF THE SEWAGE THAT I WILL CARRY OUT, AND THAT MY OPERATION WILL BE IN ACCORDANCE WITH THE PERMIT(S) ISSUED. FURTHER, I AM AWARE THAT I AM EXPECTED TO CONDUCT ALL MY ACTIVITIES UNDER MY LICENCE IN A GOOD WORKMANLIKE MANNER.

I ACKNOWLEDGE THE ABOVE NOTED POWERS OF A DIRECTOR AUTHORIZED UNDER PART VII OF THE ENVIRONMENTAL PROTECTION ACT, TO REFUSE TO ISSUE OR RENEW A LICENCE OR TO SUSPEND OR REVOKE A LICENCE AND ALSO MY RIGHT OF APPEAL UNDER SECTION 121(2) OF THE ACT AND THAT THE ADDRESS OF THE ENVIRONMENTAL APPEAL BOARD IS 1 ST. CLAIR AVENUE WEST, TORONTO, ONTARIO M4V 1K7.

Ministère
de
l'Environnement
Ontario

RÉSERVÉ AU MINISTÈRE

DOSSIER ....

DATE DE RÉCEPTION ....

Nº DE REÇU ....

DEMANDE DE PERMIS
EN VERTU DE L'ARTICLE 69 DE LA
LOI INTITULÉE "THE ENVIRONMENTAL PROTECTION ACT
(LOI SUR LA PROTECTION DE L'ENVIRONNEMENT)

1. REQUÉRANT: NOM .... Nº DE TÉLÉPHONE ....

   ADRESSE ....

2. PERMIS REQUIS POUR: — PERMIS DE LA CATÉGORIE 1 ☐ CONSTRUCTION SUR PLACE, INSTALLATION, ENTRETIEN, RÉPARATION, NETTOYAGE ET VIDANGE DE SYSTÈMES D'ÉVACUATION DES EAUX USÉES

   — PERMIS DE LA CATÉGORIE 2 ☐ TRANSPORT, ENTREPOSAGE ET ENLÈVEMENT DES EAUX USÉES DES SYSTÈMES D'ÉVACUATION Y COMPRIS LA VIDANGE À CES FINS.

3. ENTREPRISE

   A) ENTREPRISE PRIVÉE — VÉRIFIER SI LE TITRE DE PROPRIÉTÉ A CHANGÉ PAR RAPPORT À UNE DEMANDE PRÉCÉDENTE

   — NOM DU PROPRIÉTAIRE S'IL N'EST PAS LE REQUÉRANT ....

   — ADRESSE .... Nº DE TÉLÉPHONE ....

   B) INDIQUER S'IL S'AGIT D'UNE SOCIÉTÉ EN NOM COLLECTIF ☐ OU D'UNE COMPAGNIE ☐ ET JOINDRE LES NOMS ET ADRESSES:

   1) DE TOUS LES ASSOCIÉS, MEMBRES OU ADMINISTRATEURS
   2) DE TOUS LES ASSOCIÉS, ADMINISTRATEURS OU EMPLOYÉS À PLEIN TEMPS QUI SERONT CHARGÉS DE SURVEILLER LES TRAVAUX
   3) DU OU DES REPRÉSENTANTS OFFICIELS QUI S'ASSURERONT DE LA CONFORMITÉ À LA LOI ET AUX RÈGLEMENTS

   REMARQUE: CES RENSEIGNEMENTS SONT EXIGÉS PAR LE RÈGLEMENT DE L'ONTARIO 374/81, ARTICLE 14(8). LES CHANGEMENTS DOIVENT ÊTRE SIGNALÉS AU DIRECTEUR DANS LES 30 JOURS SUIVANT LEUR DATE D'EFFET.

4. ÉQUIPEMENT: JOINDRE UNE DESCRIPTION DE L'ÉQUIPEMENT POSSÉDÉ OU QUI SERA UTILISÉ DANS CE SYSTÈME.

5. ZONE D'ACTIVITÉS: INDIQUER LES RÉGIONS, DISTRICTS OU MUNICIPALITÉS OÙ LES ACTIVITÉS AURONT LIEU.

6. LE REQUÉRANT A-T-IL DÉJÀ FAIT UNE DEMANDE DE PERMIS .... (OUI OU NON) SI UN PERMIS A ÉTÉ DÉLIVRÉ, DONNER LE Nº ....

7. JE COMPRENDS LA TENEUR DES ARTICLES 69 ET 121(2) DE LA LOI INTITULÉE THE ENVIRONMENTAL PROTECTION ACT, ET DE L'ENGAGEMENT DU REQUÉRANT IMPRIMÉS AU VERSO DE LA PRÉSENTE ET JE M'ENGAGE À M'Y CONFORMER.

   LE .... 19 ....
   SIGNATURE DU REQUÉRANT

RECOMMANDATION

8. JE RECOMMANDE L'ÉTABLISSEMENT OU LE REFUS D'UN PERMIS SELON LA DEMANDE (EN CAS DE REFUS, INDIQUER LES RAISONS PAR ÉCRIT)

....
(SIGNATURE)

....
(DATE) (FONCTION)

....
(BUREAU)

BUREAU DES PERMIS

9. A) PERMIS DE CATÉGORIE .... Nº .... ÉTABLI LE ....
   (DATE)

   B) PERMIS REFUSÉ POUR LES RAISONS JOINTES:

....
(DATE) (DIRECTEUR)

PERMIS — ARTICLE 69 — THE ENVIRONMENTAL PROTECTION ACT

PERMIS OBLIGATOIRE

69. — 1) NUL NE DOIT SE LIVRER À DES ACTIVITÉS

A) DE CONSTRUCTION SUR PLACE, D'INSTALLATION, DE RÉPARATIONS, D'ENTRETIEN, DE NETTOYAGE OU DE VIDANGE DE SYSTÈMES D'ÉVACUATION DES EAUX USÉES, OU

B) D'ENTREPOSAGE, DE CAMIONNAGE OU D'ENLÈVEMENT DES EAUX USÉES PROVENANT D'UN SYSTÈME D'ÉVACUATION,

SANS AVOIR AU PRÉALABLE OBTENU DU DIRECTEUR UN PERMIS À CETTE FIN.

DEMANDE DE PERMIS

2) SOUS RÉSERVE DES DISPOSITIONS DU PARAGRAPHE 3, TOUT REQUÉRANT D'UN PERMIS

A) QUI VERSE LE DROIT PRESCRIT; ET

B) SE CONFORME AUX EXIGENCES DES RÈGLEMENTS,

A DROIT À UN TEL PERMIS ÉTABLI PAR LE DIRECTEUR.

POUVOIRS DU DIRECTEUR

3) LE DIRECTEUR PEUT

A) REFUSER D'ÉTABLIR OU DE RENOUVELER UN PERMIS; OU

B) SUSPENDRE OU RÉVOQUER UN PERMIS,

LORSQUE LE TITULAIRE DUDIT PERMIS SE TROUVE EN VIOLATION DE LA PRÉSENTE LOI OU DE SES RÈGLEMENTS, OU LORSQUE LEDIT TITULAIRE ENFREINT L'UNE QUELCONQUE DES CLAUSES DU PERMIS OU LORSQUE LE DIRECTEUR ESTIME

C) QUE LE REQUÉRANT OU LE TITULAIRE D'UN PERMIS OU, LORSQUE LE REQUÉRANT OU LE TITULAIRE EST UNE COMPAGNIE, SES DIRIGEANTS OU SES ADMINISTRATEURS, N'ONT PAS LA COMPÉTENCE VOULUE POUR SE LIVRER AUX ACTIVITÉS AUTORISÉES PAR LEDIT PERMIS;

D) QUE LES ANTÉCÉDENTS DU REQUÉRANT OU DU TITULAIRE OU, LORSQUE LE REQUÉRANT OU LE TITULAIRE EST UNE COMPAGNIE, CEUX DE SES DIRIGEANTS OU DE SES ADMINISTRATEURS, DONNENT DE BONNES RAISONS DE CROIRE QUE LES ACTIVITÉS AUTORISÉES PAR LEDIT PERMIS NE SERONT PAS EXERCÉES CONFORMÉMENT À LA LOI;

E) QUE LE REQUÉRANT OU LE TITULAIRE NE POSSÈDE PAS OU NE POURRA PAS DISPOSER DE TOUS LES LOCAUX, INSTALLATIONS ET ÉQUIPEMENTS NÉCESSAIRES AUX ACTIVITÉS AUTORISÉES PAR LE PERMIS, CONFORMÉMENT À LA PRÉSENTE LOI ET À SES RÈGLEMENTS; OU

F) QUE LE REQUÉRANT OU LE TITULAIRE NE POURRA PAS RESPECTER LES DISPOSITIONS DE LA PRÉSENTE LOI ET DE SES RÈGLEMENTS.

4) LE DIRECTEUR PEUT IMPOSER, MODIFIER OU ANNULER DES CLAUSES D'UN PERMIS AFIN

A) DE LIMITER LA ZONE D'ACTIVITÉS DU TITULAIRE; ET

B) DE CONTRÔLER LA MÉTHODE OU L'ENDROIT, OU LES DEUX, D'ENTREPOSAGE, DE CAMIONNAGE, DE COLLECTE, DE TRANSFERT ET D'ENLÈVEMENT DES EAUX USÉES D'UN SYSTÈME D'ÉVACUATION.

EXPIRATION D'UN PERMIS

5) LES PERMIS EXPIRENT DOUZE MOIS APRÈS LA DATE D'ÉTABLISSEMENT OU DE RENOUVELLEMENT.

6) LES PERMIS NE SONT PAS TRANSFÉRABLES.

ARTICLE 121(2) — THE ENVIRONMENTAL PROTECTION ACT

121(2) LORSQUE LE DIRECTEUR

A) REFUSE D'ÉTABLIR OU DE RENOUVELER OU ANNULE OU SUSPEND UN PERMIS;

B) IMPOSE CERTAINES MODALITÉS LORS DE L'ÉTABLISSEMENT D'UN PERMIS OU D'UN CERTIFICAT D'APPROBATION OU D'UN CERTIFICAT D'APPROBATION PROVISOIRE; OU

C) MODIFIE LES CLAUSES D'UN CERTIFICAT D'APPROBATION, D'UN CERTIFICAT D'APPROBATION PROVISOIRE, OU D'UN PERMIS APRÈS SA DÉLIVRANCE,

IL DOIT EN DONNER UN AVIS PAR ÉCRIT, AVEC LES RAISONS, AU REQUÉRANT OU À LA PERSONNE À QUI LE PERMIS OU LE CERTICAT D'APPROBATION OU LE CERTIFICAT D'APPROBATION PROVISOIRE EST DELIVRÉ, SELON LE CAS, ET LE REQUÉRANT OU LA PERSONNE PEUT, PAR VOIE D'AVIS PAR ÉCRIT AU DIRECTEUR ET À LA COMMISSION CONNÉ DANS LES QUINZE JOURS DE LA RÉCEPTION DE L'AVIS DU DIRECTEUR, EXIGER UNE AUDIENCE DE LA COMMISSION. 1971, CH. 86, ART. 78(2); 1972, CH. 106, ART. 28.

ENGAGEMENT DU CANDIDAT

J'AI PRIS CONNAISSANCE DES DISPOSITIONS DE LA LOI INTITULÉE THE ENVIRONMENTAL PROTECTION ACT (LOI SUR LA PROTECTION DE L'ENVIRONNEMENT) CI-DESSUS ÉNONCÉES ET DES DISPOSITIONS DU RÈGLEMENT DE L'ONTARIO 374/81, ARTICLE 14, TELLES QU'INDIQUÉES DANS LA PRÉSENTE FORMULE. JE COMPRENDS ÉGALEMENT QUE, D'APRÈS L'ARTICLE 14 DU RÈGLEMENT, LE DIRECTEUR AYANT QUALITÉ POUR ÉTABLIR LES PERMIS PEUT EXIGER D'UN REQUÉRANT QU'IL SUBISSE UN EXAMEN DEVANT UNE PERSONNE DÉSIGNÉE PAR LE DIRECTEUR, À CONDITION QUE LEDIT REQUÉRANT SOIT AVISÉ PAR LETTRE RECOMMANDÉE DE LA DATE, DE L'HEURE ET DE L'ENDROIT FIXÉS POUR L'EXAMEN ET DE TOUS LES RENSEIGNEMENTS OU PREUVES ÉTABLISSANT LES QUALIFICATIONS DU REQUÉRANT POUR SE LIVRER AUXDITES ACTIVITÉS QUE PEUT EXIGER LE DIRECTEUR, ET UN TEL AVIS DOIT ÊTRE DONNÉ 7 JOURS AVANT LA DATE FIXÉE. LORSQUE LE REQUÉRANT EST UNE SOCIÉTÉ EN NOM COLLECTIF OU UNE COMPAGNIE, L'EXAMEN, LE CAS ÉCHÉANT, DOIT ÊTRE SUBI PAR LE REPRÉSENTANT OFFICIEL (VOIR 3(B) 3) DE LA PRÉSENTE FORMULE). JE COMPRENDS ÉGALEMENT QUE L'ARTICLE 14(4) DU RÈGLEMENT STIPULE QU'UNE DEMANDE DE RENOUVELLEMENT DE PERMIS DOIT ÊTRE SOUMISE AU MOINS 30 JOURS AVANT LA DATE D'EXPIRATION DU PERMIS À RENOUVELER.

SI UN PERMIS M'EST ACCORDÉ, JE M'ENGAGE PAR LES PRÉSENTES, EN TANT QUE TITULAIRE D'UN PERMIS DE CATÉGORIE 1, À NE CONSTRUIRE, INSTALLER, ÉTABLIR, AGRANDIR, PROLONGER OU MODIFIER QUE LES SYSTÈMES D'ÉVACUATION POUR LESQUELS EXISTE UN CERTIFICAT D'APPROBATION VALIDE, TEL QU'EXIGÉ PAR LES RÈGLEMENTS, ET SEULEMENT CONFORMÉMENT AUX CONDITIONS DUDIT CERTIFICAT, À MOINS QUE DES CHANGEMENTS N'AIENT ÉTÉ AUTORISÉS PAR LE DIRECTEUR QUI A ÉTABLILE CERTIFICAT OU, EN TANT QUE TITULAIRE D'UN PERMIS DE CATÉGORIE 2, À NE PROCÉDER QU'AUX OPÉRATIONS DE VIDANGE, CAMIONNAGE, ENTREPOSAGE ET ENLÈVEMENT DES EAUX USÉES DES SYSTÈMES D'ÉVACUATION PRIVÉS, SOUS RÉSERVE QUE JE POSSÈDE UN OU DES CERTIFICATS D'APPROBATION ET UN OU DES PERMIS D'EXPLOITATION D'UN SYSTÈME DE CATÉGORIE 7 AUTORISANT SPÉCIFIQUEMENT LESDITES ACTIVITÉS ET LES MOYENS EMPLOYÉS ET JE M'ENGAGE À CE QUE L'EXPLOITATION SOIT CONFORME AUX PERMIS DÉLIVRÉS. DE PLUS, IL EST BIEN ENTENDU QUE L'EXÉCUTION DE TOUTES LES ACTIVITÉS DANS LE CADRE DE MON PERMIS SE FERA SELON DE HAUTES NORMES PROFESSIONNELLES.

JE COMPRENDS LES POUVOIRS CI-DESSUS DONT UN DIRECTEUR AYANT QUALITÉ EST INVESTI EN VERTU DE LA PARTIE VII DE LA LOI INTITULÉE THE ENVIRONMENTAL PROTECTION ACT, RELATIFS AU REFUS DE LA DÉLIVRANCE OU DU RENOUVELLEMENT D'UN PERMIS OU À LA SUSPENSION OU À LA RÉVOCATION D'UN PERMIS. JE CONNAIS MON DROIT D'APPEL EN VERTU DE L'ARTICLE 121(2) DE LA LOI ET JE PRENDS NOTE DE L'ADRESSE DE L'ENVIRONMENTAL APPEAL BOARD, 1 ST. CLAIR AVENUE WEST, TORONTO, ONTARIO, M4V 1K7.

Ministry of the Environment — Ministère de l'Environnement

Ontario

Licence Number
Numéro de permis

LICENCE / PERMIS

(Under the Environmental Protection Act, Section 69)
(En vertu de la loi Sur la protection de l'environnement, l'article 69)

....
(name of licensee)/*(nom du titulaire du permis)*

....
(street no. and address)/*(adresse: no et rue)*

....
(city, town, etc.)/*(ville, etc.)* (region, county or district)/*(région, comté ou district)* (postal code)/*(code postal)*

having complied with the requirements of the Act and the Regulations is hereby issued a Class .... licence to engage in the business of:
s'étant conformé aux exigences de la Loi et des Règlements reçoit, par les présentes, un permis de la catégorie .... l'autorisant à se livrer aux activités suivantes:

a) constructing on site, installing, repairing, servicing, cleaning or emptying sewage systems .... ☐
a) construction sur place, installation, réparation, entretien, nettoyage et vidange de systèmes d'évacuation des eaux usées .... ☐

b) hauling, storing and disposing of sewage from a sewage system, including emptying for these purposes .... ☐
b) entreposage, camionnage ou enlèvement des eaux usées provenant d'un système d'évacuation, y compris les vidanges à ces fins.................................... ☐

Subject to the following conditions/*Sous réserve des conditions suivantes:*

1. That, if this is a Class 1 licence, the licensee not repair or service any Class 6 sewage system except when the Director has so authorized the licensee hereon or in writing.
1. Que si le permis est de la catégorie 1, le titulaire du permis n'est pas autorisé à réparer ou à entretenir tout système d'évacuation des eaux usées de la catégorie 6, sauf lorsque le Directeur a autorisé le titulaire du permis à effectuer ces travaux sur le présent permis ou par écrit.

Issued at/*Établi à* as of the/*le* day of/*jour de* 19

.... , Director/*Directeur*

NOTE: ~~Section 69 of the Act concerning the requirements for a licence and the powers of a Director authorized to issue licences, and~~ Section 121(2) of the Act relative to appeals, and a statement of the responsibilities of the licensee with respect to Certificates of Approval, Permits and good workmanship are printed on the reverse for the information of the licence holder.
This licence expires 12 months after the date of issue. Application for renewal must be made at least 30 days prior to the expiry date.

REMARQUE: ~~L'article 69 de la loi relative aux conditions d'établissement des permis et aux pouvoirs du Directeur autorisé à établir des permis, ainsi que~~ l'article 121(2) de la loi relative aux appels et à l'engagement du titulaire de permis concernant les certificats d'approbation, permis et hautes normes professionnelles, sont imprimés au verso du présent permis dans un but d'information du titulaire du permis.
Le permis expire 12 mois après la date d'établissement. La demande de renouvellement doit être déposée au moins 30 jours avant la date d'expiration.

MOE 1048 (11/81)

SECTION 121 (2) — ENVIRONMENTAL PROTECTION ACT

121(2) when the Director,

(a) refuses to issue or renew or cancels or suspends a licence or permit;

(b) imposes terms and conditions in issuing a licence or permit or certificate of approval or provisional certificate of approval; or

(c) alters the terms and conditions of a certificate of approval, provisional certificate of approval, a licence or permit after it is issued,

The Director shall serve notice together with written reasons therefor upon the applicant or the person to whom the licence or certificate of approval or provisional certificate of approval is issued, as the case may be, and the applicant or person may, by written notice served upon the Director and the Board within fifteen days after the service of the notice, require a hearing by the Board. 1971, c. 86, s. 78(2); 1972, c. 106, s. 28.

L'ARTICLE 121 (2) — LOI SUR LA PROTECTION DE L'ENVIRONNEMENT

121(2) lorsque le Directeur

a) refuse d'établir ou de renouveler ou annule ou suspend un permis,

b) impose certaines modalités lors de l'établissement d'un permis ou d'un certificat d'approbation ou d'un certificat d'approbation provisoire ou

c) modifie les clauses d'un certificat d'approbation, d'un certificat d'approbation provisoire, ou d'un permis après sa délivrance,

il doit en donner un avis par écrit, avec les raisons, au requérant ou à la personne à qui le permis ou le certificat d'approbation ou le certificat d'approbation provisoire est délivré, selon le cas, et le requérant ou la personne peut, par voie d'avis par écrit au Directeur et à la Commission donné dans les quinze jours de la réception de l'avis du Directeur, exiger une audience de la Commission.

LICENSEE'S RESPONSIBILITIES

The licensee, if holder of a Class 1 licence, shall not construct, install, establish, enlarge, extend, or alter a sewage system (Class 1 systems excepted) unless there is a valid Certificate of Approval for the system as required by the Act and Regulation and in his work shall follow the requirements of the Act and the Regulation for the type of system proposed, unless specifically modified or added to by the terms and conditions of the Certificate of Approval which the licensee must meet, or as they may be subsequently changed by the Issuing Director. It is the licensee's responsibility to review each Certificate of Approval, appraise the conditions at the site and, before commencing work, draw to the Issuing Director's attention any circumstances which prevent the licensee from complying with the Certificate of Approval, the Act or the Regulation. Conditions which have obviously changed since the inspection of the applicants proposal was made and which prevent compliance with the requirements, or conditions which would render the system unsuitable for the proposed use. The holder of a class 2 licence shall conduct the operation of emptying sewage systems and hauling, storing and disposing of sewage from sewage systems only when he is the holder of a valid certificate of approval and permit to operate a Class 7 system specifically authorizing the work he is undertaking, and then only in accordance with the terms and conditions of the permit. All licensees are expected to conduct their activities under their licence in a good workmanlike manner.

ENGAGEMENT DU TITULAIRE DE PERMIS

Le titulaire d'un permis de la catégorie 1 s'engage à ne pas construire, installer, établir, agrandir, prolonger ou modifier un système d'évacuation des eaux usées (à l'exception de systèmes de la catégorie 1), sauf s'il existe un certificat d'approbation valide relatif au système, tel qu'exigé par la Loi et le Règlement, et dans l'exécution de son travail, il s'engage à respecter les conditions imposées par la Loi et le Règlement pour le type de système proposé, sauf en cas de modification ou d'adjonction spécifiques précisées dans les modalités du certificat d'approbation que le titulaire de permis doit respecter ou qui peuvent être changées ultérieurement par le Directeur qui a établi le certificat. Il incombe au titulaire de permis de vérifier chaque certificat d'approbation, d'évaluer les conditions sur les lieux et, avant d'entamer les travaux, de signaler au Directeur qui a établi le certificat tout ce qui empêche le titulaire de permis de respecter les conditions du certificat d'approbation, de la Loi ou du Règlement. Par exemple, lorsque les conditions ont, de toute évidence, changé depuis l'inspection de la demande du requérant et rendent impossible le respect des exigences, ou lorsque les conditions rendraient le système impropre à l'usage prévu. Le titulaire d'un permis de la catégorie 2 ne doit effectuer les travaux de vidange de systèmes d'évacuation des eaux usées, de camionnage, d'entreposage et d'enlèvement des eaux usées des systèmes d'évacuation que lorsqu'il détient un certificat d'approbation valide et un permis d'exploitation d'un système de la catégorie 7 autorisant spécifiquement les travaux qu'il entreprend et, alors, uniquement conformément aux modalités du permis. Tous les titulaires de permis doivent exécuter tous les travaux en vertu de leur permis selon des normes professionnelles élevées.

INFORMATION SHEET - CLASS 7 SYSTEMS
MAJOR VEHICLES AND EQUIPMENT

Name of Firm .... Cl.2 Licence No.......................

Address .... Tel. No ....

Vehicle or Barge - Data on each unit where item is appropriate - add sheets if required

Item	Unit 1	Unit 2	Unit 3
Vehicles			
Year of make			
Model			
Licence No.			
P.C.V. Licence			
Name on vehicle			
Colour			
Tank capacity (litres)			
Length of suction hose			
Max. working lift of pump at max. hose length			
Barges			
Max. draft (loaded)			
Tanks on barge deck or integral with hull			
If hull type, is hull double or single			
Tankage made of steel of other material (state)			
Tank capacity			
Max. suction distance			
Max. delivery distance			
Is barge transportable by truck			
f not list lake(s) it can serve			
Is barge self-propelled, towed or pushed			

CERTIFICATES OF APPROVAL AND FEES

1 GENERAL

(a) Section 64 of the Environmental Protection Act directs that no person shall construct, install, establish, enlarge, extend or alter any sewage system without a Certificate of Approval. It also prohibits the same actions respecting a structure, in connection with which the sewage system is used, if such actions will affect the operation or effectiveness of the sewage system, unless a Certificate of Approval for any work required on the sewage system has been obtained. This applies to all classes of sewage systems covered under Part VII of the Act except Class 1 systems. It provides a control for the use of private sewage disposal systems in the Province of Ontario, ensuring that the provisions of the Act and Regulations are complied with, the public interest is protected and the quality of the natural environment is not impaired.

(b) The powers of the Director to refuse, suspend or revoke a Certificate of Approval, or to impose, alter or revoke the terms and conditions in a certificate are stated in Section 65 of the Act.

(c) Certificates of Approval expire 12 months from the date of issue, but may be extended for a longer period at the discretion of the Director. If the Director is of the opinion that the delay in carrying out the work approved on the Certificate has been because of a change in the plans of the applicant, he may require a new application to be made.

2 APPLICATION FOR A CERTIFICATE OF APPROVAL

(a) Class 2-6 systems inclusive - The Information Sheet in Appendix 3.1.1
contains details of the procedure to be followed by applicants. Appendix 3.3.1 illustrates the form to be used for applications for Certificates of Approval for sewage systems in Classes 2 to 6 inclusive. This form is to be completed by the applicant and submitted to the Director, accompanied by a cheque or money order for the prescribed fee payable to the municipality

When an agreement under Section 70 of the Act is in effect, a local board of a health unit is a "municipality". In areas where Part VII is administered by the Ministry, payment is made to the Treasurer of Ontario. Each application should be in sufficient copies for final distribution to the approving office (original), the owner or his representative, the Building Permit office and the inspector.

(b) Class 7 systems; - Appendix 3.3.2 is the form to be used for applications for a Certificate of Approval and Permit to Operate a Class 7 Sewage System. It should be clear that the licence required by the operator of Class 7 system entitles him to be "in the business" as an operator of such a system. It does not authorize any specific work and all such activities, storage and disposal methods, etc. must be approved on one or more Certificates of Approval and Permits.

3 APPLICATIONS FOR CERTIFICATES OF APPROVAL USING THE FORM AT APPENDIX 3.3.1 WILL MOST FREQUENTLY ARISE IN THE FOLLOWING SITUATIONS:

(a) NEW CONSTRUCTION - Persons wishing to construct a Class 2-6 sewage system on a vacant lot must apply for a Certificate of Approval. Arrangements should be made with the local municipalities to ensure that a building permit is not issued unless the owner is able to produce a Certificate of Approval. The application for a Certificate of Approval may be submitted on behalf of the owner by a licensed contractor or person acting as the owner's agent.

(b) ALTERATIONS OR ADDITIONS TO EXISTING STRUCTURES - Persons wishing to alter or extend existing structures in connection with which a sewage system is used should check with the local office administering the private sewage program to determine if the proposed alterations or extensions will necessitate a change to the existing sewage system. If changes are necessary, an application must be submitted and a Certificate of Approval obtained. Arrangements should be made with the municipalities to ensure that a Building Permit is not issued unless the applicant has a Certificate of Approval, or good reasons why one is not required.

(c) CONSTRUCTION OF A SEWAGE DISPOSAL SYSTEM FOR AN EXISTING STRUCTURE - When a person wishes to construct a new Class 2-6 sewage disposal system for an existing structure when no system existed previously, an application for a Certificate of Approval is required.

(d) COMPLAINTS, SANITARY SURVEYS - Owners of sewage disposal systems, which are found to contravene the Environmental Protection Act or the Ontario Water Resources Act, must and apply for a Certificate of Approval for any corrective work. These matters are further detailed in the chapters covering surveys and complaints.

(e) COMMERCIAL ESTABLISHMENTS - Owners of trailer parks, hotels, motels, restaurants, lodges and any other commercial establishment must make application for a Certificate of Approval in the manner outlined above. At the time of obtaining application forms the owner, or the person acting for the owner, such as a consultinci engineer, should discuss the outline of his proposal with members of the approving office. This is to ensure that plans and system design will be based on the Ministry's regulations and guidelines.

(f) REPAIRS - Repairs include the normal replacement of worn-out or defective parts and work to restore a system to its original design, such as in repairs to parts damaged by erosion. As such they may be undertaken by the owner without a Certificate of Approval. In this context, a "part" refers to the major elements of a sewage system such as the septic or aerobic tank, a leaching bed and a pump chamber. Repair of a major part does not include its complete replacement unless it already conforms with the requirements of the regulation. If it does not, its replacement should follow the procedure in (g) hereunder.

(g) UPGRADING EXISTING SYSTEMS - Improvements to existing systems may be required as a result of complaints, sanitary surveys or Cottage Pollution Control Program surveys. In such cases, action as per (d) above is required. In other cases, the upgrading may be initiated voluntarily by the owner, normally because he has some evidence of malfunction, or is concerned that his system may be contributing to pollution, or is aware that a major part requires

replacement. The improvements may involve the replacement of parts, which are sub-standard for the sewage flows or site conditions, with parts meeting the requirements of the Regulation for those conditions. If it is not possible to meet these requirements, the maximum practical improvement that can be effected should be undertaken. A Certificate of Approval will normally be required under Section 64 of the Act as it refers to "extension, enlargement or alteration" of systems.

4 SEWAGE HAULAGE CONTRACTORS

After receipt of Licence to operate a Class 7 sewage system, an individual must submit an application for a Certificate of Approval and Permit using the form at Appendix 3.3.2. The Licence authorizes the individual to establish his business while the Certificate of Approval defines the conditions and area of operations. Any changes in the conditions under which the Permit was issued require a new application. Thus, a Class 7 sewage system operator may have several operating permits related to his Licence. The form of the Certificate of Approval and Permit to Operate is shown in Appendix 3.3.3. While the issuing of a Licence is a Ministry responsibility, the issuing and control of Certificates of Approval and Permits are responsibilities of the agency administering the sewage program under Part VII of the Act.

5 INSTALLERS

Before a licensed contractor commences work on a system, other than on a Class 1 system, or work on a minor repair as described in subsection (f) above, a Certificate of Approval for the job is required. The Certificate may be applied for by the individual or company owning the existing or proposed establishment, or by the contractor on behalf of the owner. In either case, it is the contractor's responsibility to make sure there is a valid Certificate before he commences work, and to ensure that the work he undertakes follows the Act and Regulations and the terms and conditions on the Certificate, unless these are changed by the issuing Director.

6 FEES

The regulation sets minimum fees for applications for Certificates of Approval for the construction, installation or establishment of a Class 4, Class 5, Class 6 or Class 7 sewage system or for the enlargement, extension or alteration of such systems. Section 70 of the Act provides for higher fees to be set by agencies deliverying the private sewage program under agreements with the Crown.

7 TERMS AND CONDITIONS ON CERTIFICATES OF APPROVAL

Subsequent to a site inspection, and the completion of any tests, the inspector must determine the requirements for the construction, installation, enlargement or alteration of the system, and record any special conditions on the Certificate. If space on the form is inadequate, additional sheets may be attached to the Certificate and referred to therein. If the standards included in the Regulation are sufficient to describe the work, additional details need not be given. Otherwise, the requirements must be given to the builder in full detail so that there is no question as to what is to be built by the contractor or carried out by the owner. Some typical examples of terms and conditions that may be added to a Certificate of Approval are:

(a) Special side slope for fill if the 2:1 minimum is proposed, but is not adequate for stability.

(b) Instructions related to construction methods and requirements peculiar to the site that are not covered in regulations and are considered essential by the inspector. Such needs as removal of organic soils, preparation of a level base for the fill, addition of soil mantle, construction to divert surface run-off and other drainage improvements are examples of such conditions.

(c) Specifying the source and quality of fill to be used.

(d) Requirements greater than the minimums set down in the Regulation may be imposed under Section 65 of the Act. The reasons for such requirements should be recorded on the Certificate of Approval. Examples are an increase to the minimum clearance distances and a need for a spare area. It is advisable also to explain requirements in excess of those set down in this Manual.

(e) A statement outlining any part of the proposal that has been approved at a lower standard than the minimum requirements of the Regulations (or of the guidelines, if significant). An indication of why this was accepted should be recorded on the Director's file and consideration given to including such reasons on the Certificate of Approval.

(f) A requirement that the owner register the Certificate of Approval on Title. Typical circumstances where this may be required are:

(i) The approval was conditional on some provision that is of a continuing nature, or that will be in force until some action specified in the certificate is completed. An example would be the reservation, for sewage disposal only, of an area on the property considered essential to the future construction or expansion of a sewage system, or to the subsurface dispersal of sewage as it moves laterally away from the leaching bed area.

(ii) As a warning to a future buyer that the system approved is in some specified way below the standards of the regulation, or that the type of system installed requires some special attention or action on the part of any owner (e.g. service contract for a class 6 system).

8 DIRECTORS' AND INSPECTORS' ACTIONS AND RESPONSIBILITIES

The term Director as used in this section refers to any individual who has been designated as a Director for the purpose of issuing Certificates of Approval under Part VII of the Act. An inspector may or may not also be a Director. The Director's actions and responsibilities in relation to Certificates of Approval include:

(a) On receipt of an application for a Certificate of Approval for a Class 2 to 6 system, an inspector shall carry out a site inspect--tion and complete the form at Appendix 3.3.1. If the proposal meets the requirements of the Act, the Regulation and the guide-lines, the Certificate of Approval (App. 3.3.1 page 2) shall be issued to the applicant by the Director.

When an application cannot be approved, the Director should be satisfied that there is no apparent and acceptable alternate solution to the applicant's problem. If no such option exists, the reasons for refusal of a Certificate should be recorded on the form. As space on the form is limited, additional sheets may be added and referred to on the form. The <u>inspector is advised to record his findings in detail and retain his field notes as they may be necessary in the event that the decision is appealed.</u>

(b) On receipt of an application for a Certificate of Approval and Permit to Operate a Class 7 system, the inspector will verify the information provided. This entails an inspection of the system and the equipment to be used and an inspection of the disposal site(s) covered in the application. If found in order, a Certificate of Approval on the form at Appendix 3.3.3 may be issued which authorizes the proposal in the application, outlines any parts of the application not approved, and states any limitations and restrictions on the work. It should also outline any further works or purchases which must be completed to the Director's satisfaction before a Permit is issued. These may have been included in the application as intentions, or are considered necessary by the Director. Such works could include the construction of storage facilities, barges, or works at disposal sites. Once these have been completed to the Director's satisfaction, the Permit to Operate at Appendix 3.3.3 can be issued. Should there be no works or requirements to be carried out between the issuance of the Certificate of Approval and the commencement of operations, the Director could issue both the Certificate of Approval and Permit to Operate at the same time.

(c) The use of his discretionary powers under Section 65 of the Act. For more detail on approvals of this nature excerpts from an Information Sheet prepared by Legal Services Branch on the "Use of Discretionary Power's and issued as a Notice on January 2, 1976 are attached as App. 3.3.4.

9 REGISTRATION OF CERTIFICATES OF APPROVAL ON TITLE

A procedure for registering Certificates of Approval on Title is outlined in App. 3.3.5 for registration under both the Land Titles Act and, the Registry Act.

10 APPEALS UNDER SECTION 121 OF THE ACT

If a Director refuses to issue a Certificate of Approval, or imposes terms and conditions on issuing a Certificate, he must advise the applicant in writing of the reasons for the refusal, or the terms and conditions, and of the applicant's right to appeal the decision by serving written notice of appeal on the Director and the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ontario, M4V 1K7 within 15 days of receipt of the Director's decision. This requirement underlines the importance of careful inspection of sites, and of the methodical recording by the inspector of any circumstances that lead to the decision made by the Director. The application form provides notice of the right to appeal and a space for the Director to record the reasons for his decision. Additional sheets may be used for reasons where the space on the form is inadequate. These procedures apply equally to any case where the Director refuses to approve plans and specifications, or where he requires a condition precedent to the giving of his approval, or where he suspends or revokes a Certificate of Approval or its terms and conditions subsequent to its issue.

.

Application No. . . . .
Fee Receipt No. . . . .
Date Received . . . .

Ministry of the Environment
Ontario

APPLICATION FORM AND CERTIFICATE OF APPROVAL FOR A CLASS 2-6 SEWAGE SYSTEM

(Please Print Clearly)

1. Name of Owner	Tel. No.	2. Installer's Name	Tel. No.

Address (No., Street, City, Town, etc.) . . . .

Address (No., Street, City, Town, etc.) . . . .

3. Propose to . . . . (Construct/Install/Alter/Extend/Enlarge) a Class. . . . . sewage system to serve . . . . (Facility: e.g. Single Family Dwelling, Motel, etc.)

4. Location — Region, County, District	Ward, Township, Town	Lot No.	Conc. No.	Sub.Lot. No.	Plan No.	Area of Lot (m^2)

5. State No. of	Bedrooms or Motel Units	People	Flush Toilets	Urinals	Washbasins	Showers and Bathtubs

6. Water Supply

Dug or Bored Well ☐
Drilled Well ☐ Municipal ☐
Other . . . .
Proposed ☐ or Existing ☐

7. Attach completed sketch on Page 2 – List other attachments:

8. Relationship to Severance if applicable

☐ Lot Approval Pending
☐ Lot Approved
Under Severance Application
No. . . . .

9. Directions to Lot:— Highway No., Secondary Roads, Signs to Follow, etc.

. . . .
. . . .
. . . .

10. I certify that the above information is complete and correct and that, if approved, the work will conform with Provincial requirements for sewage systems and local Municipal By-Laws.

Name of Agent	Tel. No.	Signature of Owner or Agent
Address (No., Street, City, Town, etc.)		. . . . Date . . . .

11. INSPECTOR'S REPORT	Inspection Time and Date . . . . . . AM PM . . . . 19.		
Weather	Representing Owner	Leaching Bed Design Criteria: Depth to Rock . . . . m.	Design H.W.T. . . . . m.
REQUIREMENTS	Length of Distribution Pipe (metres)	Working Capacity of Septic/Holding Tank (Litres)	

Sub-Surface Conditions Encountered

Rock & G.W.T.	Depth (m)	Soil Type
	0	
	0.25	
	0.50	
	0.75	
	1.00	
	1.25	
	1.50	

Conditions of Approval and Reasons (e.g. fill, grading, drainage improvements, design sewage flows) ☐
OR
Reasons where Proposal not Acceptable (add additional pages if required) ☐

. . . .
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. . . .
. . . .

Ministry of the Environment
Ontario

APPLICATION NO.

12. **LOT DIAGRAM AND SEWAGE SYSTEM PLAN:** — Draw to scale indicating north point and showing:
   a) Location of sewage system components (e.g. tanks, leaching bed). Locate and show horizontal distances from system to adjacent existing or proposed buildings, water supplies (including neighbours), existing on-site sewage systems, driveways, property lines, lakes, rivers, water courses, swimming pools.
   b) Lot dimensions, topographic features (e.g. swamps, steep slopes) near system.
   c) If any part of proposal conforms to a specific standard drawing, give reference number(s).

13. **A Certificate of Approval for this application is refused for the reasons given in Section 11 Page 1**

INSPECTED AND RECOMMENDED BY	REFUSED	DATE
	DIRECTOR	

CERTIFICATE OF APPROVAL

Application approved and this Certificate of Approval under Section 65 of the Environmental Protection Act is hereby issued for the proposal outlined on Pages 1 and 2 of the application and its attachments as amended by the requirements and conditions of Section 11 provided that the sewage system shall be completed and a Use Permit issued within 12 months of the issue hereof or such extended period as the Director on application allows. DO NOT OPERATE THE SYSTEM UNTIL A USE PERMIT IS ISSUED.

INSPECTED AND RECOMMENDED BY	ISSUED	DATE
	DIRECTOR	

Under Section 121 of the Environmental Protection Act, an applicant may appeal a decision by writing to the Director and to the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ont., M4V 1K7 within 15 days of receipt of the decision.

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Ontario Ministry of the Environment

DEMANDE DE CERTIFICAT D'APPROBATION POUR UN SYSTÈME D'ÉVACUATION DE CLASSE 2 À 6

(Ecrire lisiblement en lettres moulées)

Numéro de demande ....
Numéro de reçu de droit ....
Date de réception ....

1. Nom du propriétaire	No de tél.	2. Nom de l'installateur	No de tél.
Adresse (No, rue, ville, etc.)		Adresse (No, rue, ville, etc.)	

3. Projette de .... un système d'évacuation des eaux usées de classe ....
(construire/installer/modifier/agrandir)

pour desservir ....
(locaux par exemple, logement unifamilial, motel, etc.)

4. Emplacement région, comté, district	Circonscription, canton, ville	No de parcelle	No de conc.	No de subdivision	No de plan	Superficie de la parcelle (m^2)

5. Indiquer le nombre de	chambres à coucher ou unités de motel	personnes	toilettes à chasse d'eau	urinoirs	éviers	douches et baignoires

6. Alimentation en eau
Puits creusé ☐
Puits foré ☐ municipale ☐
Autre ....
En projet ☐ ou existante ☐

7. Joindre un croquis détaillé à la page 2 — Indiquer les autres pièces jointes:

8. Lien à une division, s'il existe
☐ Approbation de la parcelle en cours
☐ Parcelle approuvée
En vertu de la demande de division
No ....

9. Accès à la parcelle — No de route, routes secondaires, panneaux indicateurs, etc.
....
....
....

10. Je certifie que les renseignements ci-dessous sont complets et exacts et que, si le projet est approuvé, les travaux seront exécutés conformément aux normes provinciales relatives aux systèmes d'évacuation et aux règlements municipaux. (Joindre le montant du droit pour les systèmes de classe 4, 5 ou 6)

Nom de l'agent	No de tél.	Signature du propriétaire ou de son agent
Adresse (No, rue, ville, etc.)		Date ....

11. RAPPORT DE L'INSPECTEUR	Heure et date d'inscription .... matin soir le 19		Structure souterraine
Conditions atmosphériques	Représentant du propriétaire	Critère de conception du lit de filtration: Profondeur jusqu'à la roche .... m; Hauteur prévue au-dessus de la nappe .... m	Roche et nappe phréatique; Profondeur (m): 0, 0.25, 0.50, 0.75, 1.00, 1.25, 1.50; Type de sol
EXIGENCES	Longueur de tuyau de distribution en (mètres)	Capacité d'utilisation de la fosse septique/réservoir en (litres)	

Conditions d'approbation et raisons (par exemple, remblaiement, pente, amélioration du drainage, débits prévus ☐ ○
OU
Raisons de refus du projet (ajouter des pages au besoin) ☐ ○

....
....
....
....
....
....
....

1040F 3/82

EXEMPLAIRE DU BUREAU

Ministère de l'Environnement
Ontario

NUMÉRO DE DEMANDE

12. **SCHÉMA DE LA PARCELLE ET PLAN DU SYSTÈME D'ÉVACUATION** — Tracer un plan à l'échelle indiquant le nord et comportant:
   a) l'emplacement des éléments du système d'évacuation (par exemple, réservoirs, lit de filtration). Repérer et indiquer les distances horizontales du système aux bâtiments existants ou projetés adjacents, aux alimentations d'eaux (y compris celles des voisins), aux systèmes d'évacuation existants, aux voies d'accès, aux limites de la propriété, aux lacs, rivières et cours d'eau et aux piscines;
   b) les dimensions de la parcelle, les caractéristiques topographiques (par exemple, marécages, pentes abruptes) à proximité du système;
   c) si une partie quelconque du projet se conforme à un dessin standard spécifique, indiquer le ou les numéros de référence.

13. **Le certificat d'approbation pour cette demande est refusé pour les raisons indiquées à la section 11 page 1**

INSPECTÉ ET RECOMMANDÉ PAR	REFUSÉ DIRECTEUR	DATE

CERTIFICAT D'APPROBATION

La demande est approuvée. Le présent certificat d'approbation, établi en vertu de l'article 65 de la loi intitulée the Environmental Protection Act, est donc délivré pour le projet présenté aux pages 1 et 2 de la demande et aux pièces jointes, avec les modifications imposées par les exigences et conditions de la section 11, étant bien entendu que le système d'évacuation doit être construit en entier et qu'un permis d'utilisation doit être délivré dans les 12 mois de la délivrance du présent certificat ou dans les délais accordés par le directeur. NE PAS UTILISER LE SYSTÈME TANT QU'UN PERMIS D'UTILISATION N'A PAS ÉTÉ DELIVRÉ.

INSPECTÉ ET RECOMMANDÉ PAR	DÉLIVRÉ PAR DIRECTEUR	DATE

En vertu de l'article 121 de la loi intitulée the Environmental Protection Act, un requérant peut faire appel d'une décision en envoyant un avis par écrit au directeur et à l'Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ont., M4V 1K7 dans les 15 jours suivant la réception de l'avis de décision.

1041F 3/82

EXEMPLAIRE DU BUREAU

Ministry of the Environment
Ontario

Application For a Certificate of Approval and Permit For the Operation of a Class 7 Sewage System

Application No. ____________
Date Received ____________
Fee Receipt No. ____________

(Please Print Clearly)

1. Name of Licence Holder	Telephone Number	Address (No. Street, ... City, Town, etc) ....

Class 2 Licence No.	Date Licence Issued/Renewed	2. Check Service to be Performed
		Emptying ☐ Hauling ☐ Storing ☐ Disposing ☐

3. Area of Operations: State Region(s), District(s) and Municipality(s) in which operation intended. If a licenced hauler proposes to haul sewage from areas under more than one authority or to a disposal site in an area controlled by another authority, then a Certificate of Approval and Use Permit are required from each authority. If barge operation, list lake(s) served and docks to be used. (attach additional sheets if required)

____
____
____
____
____

4. Attach following supporting information as applicable and check X if attached.

(a) Details or any major equipment to be used in connection with the work covered in this application, (make, year and model, licence number P.C.V. licence, colour, hose length, type and horsepower of pumps, barge dimensions and draft, carrying capacity, etc., as applicable) .... ☐

(b) Describe disposal site (Location, Lot No., Con. No., Municipality and owner's name). Attach copies of letters of agreement with owner(s) of the disposal site or person in charge of a treatment plant .... ☐

(c) Sketch showing details of the land disposal site .... ☐

(d) Plans and design details of any works related to the proposal that must be undertaken and completed before operations commence. (e.g. works at disposal sites, temporary storage facilities, barges, docks.) .... ☐

(e) Tabulate the source(s) of hauled sewage (e.g. holding tank, septic tank, aerobic tank) and the estimated annual quantity from each source to be dumped at each disposal site .... ☐

(f) Other attachments (specify) ____________
____________ ☐

5. The above application and attachments as indicated are submitted for approval
this ________ day of ____________ 19____ by ____________
(Signature of Holder)

---

6. **For Office Use Only**

(a) Application reviewed including necessary inspections of equipment, installations and disposal sites by ____________

(b) Recommended for:

(i) Issue of Certificate of Approval with Permit to follow successful completion of requirements noted thereon .... ☐

(ii) Issue of Certificate of Approval and Permit to Operate .... ☐

____________ Date

____________ (Inspector or Supervisor)

MOE 1061 (4/78)

APPLICANT'S COPY

Ministère de l'Environnement
Ontario

Demande de certificat d'approbation et de permis d'exploitation d'un système d'évacuation des eaux usées de la catégorie 7

Nº de la demande ______
Date de réception ______
Nº du reçu des droits ______

(Écrire en caractères d'imprimerie)

1. Numéro du titulaire du permis	Nº de téléphone	Adresse (Nº, rue, ville, etc.)
Permis de la catégorie 2 nº	Date d'établissement/de renouvellement du permis	2. Indiquer le service à exécuter: Vidange ☐ Transport ☐ Entreposage ☐ Enlèvement ☐

3. Zones d'exploitation: Préciser les région(s), district(s) et municipalité(s) où l'exploitation doit avoir lieu. Si un transporteur titulaire d'un permis envisage de transporter des eaux usées se trouvant dans des régions relevant des plusieurs autorités ou de les transporter à un lieu d'évacuation dans une zone relevant d'une autre autorité, dans ce cas, un certificat d'approbation et un permis d'utilisation doivent être obtenus auprès de chacune des autorités. Dans le cas d'un service utilisant une barge, donner la liste des lacs desservis et des quais qui seront utilisés (annexer des pages supplémentaires au besoin).

4. Annexer les renseignements supplémentaires suivants, selon le cas, et cocher la case appropriée s'ils sont annexés.

(a) Détails relatifs à tout équipement important qui sera utilisé dans le cadre du travail auquel se rapporte la présente demande, (la marque, l'année et le modèle, le numéro d'immatriculation, le permis V.T.P. (PCV) la couleur, la longueur des tuyaux, le type et la puissance des pompes, les dimensions de la barge et le tirant d'eau, la charge utile, etc., selon le cas.) ☐

(b) Décrire le lieu d'évacuation (situation géographique, nº de parcelle, nº de concession, municipalité et nom du propriétaire). Annexer des copies des lettres d'accord avec le ou les propriétaires du lieu d'évacuation ou avec une personne responsable d'une usine de traitement des eaux ☐

(c) Croquis indiquant les caractéristiques du terrain destiné à recevoir les eaux usées ☐

(d) Plans et graphiques détaillés de tous les travaux liés au projet qui doivent être entrepris et terminés avant que l'exploitation commence (travaux sur les lieux d'évacuation, installations d'entreposage provisoire, barges, quais) ☐

(e) Déterminer la ou les sources des eaux usées transportées (réservoir, fosse septique, réservoir aérobique et la quantité par source et par année que l'on prévoit de déverser à chaque lieu d'évacuation) ☐

(f) Autres documents (préciser) ______ ☐

5. La demande ci-dessus et les documents annexés tel qu'indiqué sont produits aux fins d'approbation
ce ______ jour de ______ 19 ____ par ______
(Signature du Titulaire*)

6. **Réservé au service administratif**

(a) Demande étudiée, y compris les inspections nécessaires de l'équipement, des installations et des lieux d'évacuation par ______

(b) Recommandation:

(i) Établissement du certificat d'approbation avec permis à délivrer après l'exécution satisfaisante des conditions qui y figurent ☐

(ii) Établissement du certificat d'approbation et du permis d'exploitation ☐

______ Date ______ Inspecteur ou Surveillant

EXEMPLAIRE DE L'APPLICANT

Ministry of the Environment
Ontario

Certificate of Approval and Permit To Operate a Class 7 Sewage System

Application No.

Certificate of Approval

1. Under Section 65 of the Environmental Protection Act, as amended, a Certificate of Approval is hereby issued to:

______ of ______
(name of licence holder)* (address)

to carry out the work proposed in Application No. ______ and its attachment subject to the following conditions:
(outline in the space below any terms and conditions that limit or alter the works and operation proposed in the application. Reasons for the terms and conditions should be stated. (See note 1 on reverse)

______

______

______

* If the owner of the system is exempt from holding a licence insert owner's name.

2. The sewage system shall not be operated
   a) if its operator ceases to hold a valid licence for the operation of such a class 7 sewage system or
   b) for a period longer than 12 months (or such longer period as the Director approved on issue or, from time to time, specifies in writing) after the permit, below, is issued. (See note 2 on reverse)

3. A permit will not be issued until the following work is completed to the satisfaction of the Director: (Specify the work which the Director requires to be completed before a Permit to Operate will be approved and state reasons)

______

______

______

Issued on this ______ day of ______, 19____ by ______
Director

4 A Certificate of Approval for the work outlined in Application No. ______ is refused for the following reasons.
(Attached sheets as required)

______

______

______

This ______ day of ______, 19____ by ______
Director

Permit To Operate A Class 7 Sewage System

As there is no work requirement in paragraph 2 of the Certificate of Approval, or as all works outlined therein have been completed to the satisfaction of the Director, a Permit for the work outlined in the Certificate of Approval is hereby issued to the person named therein under Section 67 of the Environmental Protection Act.

Issued on this ______ day of ______, 19____ by ______
Director

This permit only authorizes implementation of the work outlined in the Certificate of Approval and requires that the work be undertaken according to the terms and conditions of the Certificate as amended. The Permit is inoperative if the Certificate of Approval is revoked or suspended or the holder ceases to hold a valid licence for the operation of a Class 7 sewage system.

Notice of Right of Appeal

Under Section 121 of the Environmental Protection Act, an applicant may appeal a decision related to a Certificate of Approval or the refusal to issue a Permit by giving written notice of appeal to the Director and to the Environmental Appeal Board, 1 St. Clair Ave. W., Toronto, Ont., M4V 1K7 within 15 days of receipt of the decision on the Certificate or of notice of refusal to issue a Permit.

Note 1 – Typical (but not inclusive) of the terms and conditions that may be considered for inclusion on the certificate are:

a) any areas of operation, disposal sites or routes to disposal sites which are not approved.

b) any restrictions imposed on a disposal site such as to time of day of disposal, quantity of sewage during any period (day, week, etc.), or time of year for disposal (e.g. only during periods April 15 – May 15 and September 30 – November 15).

c) method of disposal e.g. direct spreading, irrigation, rates of application, etc.

d) weather restrictions.

e) clean-up or other action required after disposal. (e.g. at sewage, treatment plants, selected manholes, etc.)

f) records to be submitted to the approving authority.

g) a statement outlining the circumstances which would necessitate alterations to the terms and conditions of the certificate. (e.g. subject to cancellation if a subdivision is approved on adjoining land.)

Note 2 – If the circumstances relating to a disposal site have not changed significantly since the permit was issued, and there is no reason to change the terms and conditions applied in the certificate of approval for that method of disposal, the certificate may be extended to a date deemed appropriate by the Director. If the circumstances have changed to the extent that such extension cannot, in the Director's judgement, be authorized, including, if necessary, minor alterations to the terms and conditions of the certificate, then a new application and new certificate of approval should be required. The 12 month period in condition 1 (b) may be made longer at the time the certificate is issued if the disposal method does not require frequent review. For instance, if the disposal is into a municipal sewage treatment plant with no capacity problems and not by spreading and irrigation.

Ministère de l'Environnement
Ontario

Certificat d'approbation et permis d'exploitation d'un système d'évacuation des eaux usées de la catégorie 7

Nº de la demande ____

Certificat d'approbation

1 En vertu de l'article 65 de la loi intitulée the Environmental Protection Act, telle que modifiée, un certificat d'approbation est établi au nom de

____ de ____
(nom du titulaire du permis)* (adresse)

l'autorisant à effectuer les travaux envisagés dans la demande nº ____ et les documents annexés sous réserve des conditions suivantes: (indiquer dans l'espace réservé à cet effet ci-dessous toutes les modalités limitant ou modifiant les travaux et l'exploitation prévus dans la demande. Les raisons des modalités doivent être fournies. (Voir la note 1 au verso).

____

____

____

*Si le propriétaire du système est exempté de détenir un permis, inscrire le nom du propriétaire.

2. Le système d'évacuation ne doit pas être mis en exploitation

a) si son exploitant cesse d'être titulaire d'un permis valide autorisant l'exploitation d'un tel système d'évacuation de la catégorie 7 ou

b) pendant plus de 12 mois (ou toute période plus longue que le Directeur peut accorder ou, peut stipuler par écrit à l'occasion) après l'établissement du permis ci-dessous. (Voir la note 2.)

3 Le permis ne peut pas être établi tant que les travaux suivants n'ont pas été achevés à la satisfaction du Directeur: (Préciser les travaux exigés par le Directeur avant qu'un permis d'exploitation puisse être délivré et donner les raisons)

____

____

____

Établi ce ____ **jour de** ____ **19**__ **par** ____
Directeur

4 Le certificat d'approbation des travaux décrits dans la demande nº ____ **est refusé pour les raisons suivantes.** (Annexer des feuilles supplémentaires au besoin.)

____

____

____

Ce ____ **jour de** ____ **19**__ **par** ____
Directeur

Permis d'exploitation d'un système d'évacuation des eaux usées de la catégorie 7

Étant donné qu'aucune condition d'exécution des travaux n'est stipulée au paragraphe 2 du certificat d'approbation, ou que tous les travaux qui y sont précisés ont été exécutés à la satisfaction du Directeur, le permis relatif aux travaux décrits dans le certificat d'approbation est par les présentes établi au nom de la personne désignée dans ledit certificat en vertu de l'article 67 de la loi intitulée the Environmental Protection Act.

Établi ce ____ **jour de** ____ **19**__ **par** ____
Directeur

Par ce permis, seule l'exécution des travaux précisés dans le certificat d'approbation est autorisée et les travaux doivent être entrepris conformément aux modalités du certificat tel que modifié. Le permis est sans effet si le certificat d'approbation est révoqué ou suspendu ou si le titulaire cesse de détenir un permis valide d'exploitation d'un système d'évacuation de la catégorie 7.

Avis de droit d'appel

En vertu de l'article 121 de la loi intitulée the Environmental Protection Act, le requérant peut faire appel de toute décision relative à un certificat d'approbation ou au refus d'établissement d'un permis en remettant un avis par écrit d'appel au Directeur et à la Commission d'appel de l'environnement, 1 St. Clair Avenue West, Toronto, Ontario, M4V 1K7, dans les 15 jours qui suivent la réception de la décision relative au certificat ou de l'avis de refus d'établissement de permis.

1062F 3/82

EXEMPLAIRE DE L'APPLICANT

Note 1 — Exemples typiques (mais non exhaustifs) de modalités qui peuvent être incluses dans le certificat:

a) tous lieux d'exploitation, lieux d'évacuation ou voies empruntées menant aux lieux d'évacuation qui ne sont pas approuvés;

b) toutes restrictions imposées à l'égard du lieu d'évacuation concernant, par exemple, le moment de la journée où l'évacuation peut avoir lieu, la quantité d'eaux usées pouvant être déversées au cours d'une période quelconque (jour, semaine, etc.), ou l'époque de l'année où l'évacuation peut avoir lieu (par exemple, exclusivement du 15 avril au 15 mai et du 30 septembre au 15 novembre);

c) méthode d'évacuation: dispersion directe, irrigation, taux d'application, etc.

d) restrictions en fonction des conditions météorologiques;

e) nettoyage ou autre mesure nécessaire après l'évacuation (par exemple, aux usines de traitement des eaux, certains puits d'accès, etc.);

f) documents à soumettre à l'autorité chargée de l'approbation;

g) déclaration précisant les circonstances rendent nécessaire la modification des modalités du certificat (par exemple, sous réserve d'annulation si un lotissement est approuvé sur des terres contiguës).

Note 2 — Si les conditions propres au lieu d'évacuation n'ont pas changé de manière significative depuis l'établissement du permis et si rien ne justifie le changement des modalités demandées dans le certificat d'approbation concernant la méthode d'évacuation, le certificat peut être prolongé jusqu'à une date jugée appropriée par le Directeur. En cas de changement de circonstances tel que ladite prolongation ne peut pas être autorisée de l'avis du Directeur, y compris, si nécessaire, des modifications mineures aux modalités du certificat, une nouvelle demande et un nouveau certificat d'approbation sont alors nécessaires. La période de 12 mois mentionnée au paragraphe 1b) peut être prolongée lors de l'établissement du certificat si la méthode d'évacuation ne nécessite pas de revue fréquente. Par exemple, si l'évacuation se fait dans une usine d'épuration des eaux municipales où il n'y a aucun problème de capacité et non pas par épandage ou irrigation.

PART VII - USE OF DISCRETIONARY POWER

Section 65 of the Environmental Protection Act provides:

a) The requirements which, if met, entitle an applicant to be issued a Certificate of Approval.

b) The circumstances under which the Director may refuse to issue a Certificate of Approval.

c) The circumstances under which the Director may issue a Certificate of Approval where the proposed work does not comply in all respects with the Act and the Regulations.

d) The powers of a Director to alter terms and conditions in a Certificate of Approval or to attach terms and conditions to a Certificate of Approval.

e) The powers of a Director to revoke a term or condition in a Certificate of Approval and to suspend or revoke a Certificate.

When a Certificate of Approval is being issued which differs from the application submitted, reasons should be given. A certain amount of judgement is called for in the giving of reasons. It may be that it is quite obvious that the applicant realizes that he should have applied in the first place for what you are suggesting. In such case, no formal written reasons need be given. However, unless the change is of a very minor nature, or it is apparent that the applicant is happily accepting the decision, written reasons for the decision should be given.

One of the reasons on which a decision can be based is "the public interest". If a decision is being made for public interest reasons, it is not sufficient merely to state that a condition is being imposed, or that an application is being refused, because of the public interest. It is necessary to state how the public interest is affected.

The public interest is a very loose expression and could be related to even one member of the public, such as the applicant, a possible future purchaser from the applicant, a neighbour or possible future neighbour of the applicant, or a use that would result in the contravention of a different law.

Concern has been expressed that, if a Certificate of Approval is issued for a sewage system which does not meet all the requirements of the Regulation in effect at that time under Part VII, and if damage results from the sewage system, the "Director" or Health Unit might be sued. Subsection 65(3) of the Act provides jurisdiction to issue such a certificate. It should also be noted that the Environmental Appeal than one case, issued a Certificate of Approval for a system, not comply with provisions in the regulation, when the individual circumstances of the case merited it. The ability to impose conditions different from the provisions of the regulation cannot, be used properly to make a general change in the regulation. Each departure must be considered on its own merits.

In order to reduce the chance of a suit, the Director issuing such a Certificate of Approval should give his reasons for such certificate, or at least have them noted in the Director's permanent records. In many cases, the departure will be so small that even this need not be done but, in cases where there is any real risk of harm resulting, the person receiving the certificate should be advised in writing that, if for any reason the system does not operate properly or causes any problems to health or the environment, the owner of the system will be required to remedy the matter at his own expense. This statement should be written or noted on the Certificate of Approval, or attached to and made part of the Certificate, so that any subsequent purchaser who enquires will be aware of it.

REGISTRATION OF CERTIFICATES OF APPROVAL ON TITLE

1 REGISTRATION UNDER THE LAND TITLES ACT

In order for the Certificate of Approval to be registerable

(a) the appropriate blanks on page one and page two have to be filled in;

(b) it must be prepared on one side of legal size paper;

(c) a condition affecting the title or a use which can be made of the property such as that in the example must be used;

(d) the copy which is submitted for registration must be signed (not zeroxed) by the Director.

Note - no affidavit of execution is required for the owner of his agent as he is signing the application part of the Form only - not the Certificate;

- no affidavit of execution is required for the Director even if he is a health unit or municipal employee as he is acting as an Officer of the Government of Ontario pursuant to his designation in the contract between the Minister of the Environment and his employing Health Unit or Municipality and affidavits are not required for such officers - the Registry Act - section 25(2)(d). - the same practice is followed under the Land Titles Act.

If the applicant for registration is not all of the registered owners of the property, then an affidavit along the following lines would have to be attached. It could be sworn by one of several owners or, with appropriate changes, by the installer or a Director. If the following page is single spaced the affidavit can be added at the foot of it.

AFFIDAVIT

I, JOHN SMITH, of the City of Owen Sound in the County of Grey, make oath and say:

1. I am one of the owners of the lands with respect to which the attached Certificate of Approval was issued under the provisions of Part VII of the Environmental Protection Act.

2. The above application is being made for the purposes set forth in the application and for no improper purpose.

Sworn before me at the City
of Owen Sound this________________
day of______________, 1982 ______________________
John Smith

____
A Commissioner, etc.

LAND TITLES ACT

To The Land Registrar at Owen Sound

I, JOHN SMITH, of the City of Owen Sound in the County of Grey, an owner of the land registered as Parcel_________________in the register for the Township of ____________________in the Land Registry office for the Land Titles Division of Grey North which land may be more particularly described as_________ _______________(insert sufficient legal description) in respect of which land T. Herbert Waters, of the City of Owen Sound in the County of Grey, a Director under Part VII of the Environmental Protection Act, has issued the attached Certificate of Approval, hereby apply to have the said Certificate of Approval registered on title.

The evidence in support of this application consists of:

1. The attached Certificate of Approval which has been duly issued under Part VII of the Environmental Protection Act.

2. Pursuant to subsection 1 of Section 18 of the Environmental Protection Act, the said Certificate of Approval is binding upon the successors or assigns of the person to whom it is directed.

3. This application is being made for the purpose of providing notice for the said Certificate of Approval to any person obtaining a subsequent interest in the said lands.

The address of the said Director for service is Grey-Owen Sound Health Unit, County Building, Owen Sound, Ontario.

The address of the applicant for service is___________________________
_________________________________.

DATED at Owen Sound this___________day of_________________,1982.

____
John Smith.

An example of the conditions that may be added to the Certificate of Approval is given below in the case of an approval for a class 6 sewage system designed to handle daily sewage flows in excess of 4500 litres. The conditions are inserted in the space at the bottom of page 1 of Form MOE 14-247/8 (App. 3.3.1) and the reasons given on an attached sheet as space dictates.

"It is a condition of this Certificate that:

(a) No use shall be made of the sewage system installed under authority of this Certificate unless a maintenance agreement with a service contractor, licensed under the Act to maintain this type of sewage system, is in force.

(b) The Certificate be registered on title and a duplicate copy with registration particulars be returned to the Director within 30 days of the date of issue of the Use Permit.

(c) The property on which the sewage system is installed not be sold without the purchaser being advised of this condition and the reason for it prior to any agreement of purchase and sale being entered into.

The reasons for conditions a b and c are that:

(a) the regulation under the Environmental Protection Act requires that the sewage system not be operated unless a maintenance agreement with an operator licensed under the Act to maintain this type of sewage system is in force and the supplier of the sewage system and its purchaser have entered into such an agreement.

(b) any subsequent owner of the premises served by the system should be made aware of the requirement of a maintenance agreement prior to purchasing the premises."

For registration purposes the Certificate and supporting documents must be on legal size pager. If photo-copied onto legal size the approving signature must be original. As for other legal documents of this type a final page is required which will act as a cover page when the document is folded in quarters for filing. It should bear the following printing which is to be located on the top quarter of the paper printed sideways from right to left in a manner that permits it be be read when the paper is rotated through 90 degrees.

LAND TITLES ACT

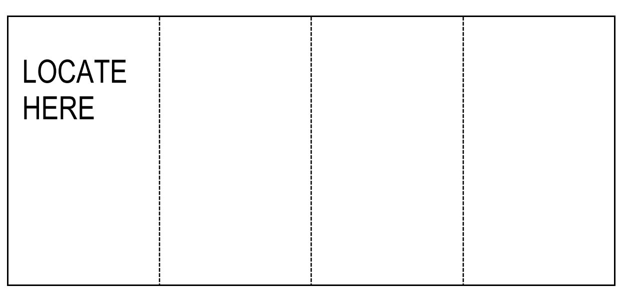
John Smith
(Insert mailing address as shown
on the face of Certificate)

Certificate issued under Part VII of the Environmental Protection Act.

(Insert reference to Lot and Concession or Lot and Plan of Subdivision number or other designation used in the Land Registry Office)

Add name and address of Health Unit or Municipality or their full time solicitor

<u>NOTE</u> The above appears on the left hand qJarter panel of legal size paper.



2 REGISTRATION UNDER THE REGISTRY ACT

In order for the Certificate of Approval to be registerable

(a) the appropriate blanks on page one and page two have to be filled in;
(b) it must be prepared on one side of legal size paper;
(c) a condition affecting the title or a use which can be made of the property such as that in the example must be used;
(d) the copy which is submitted for registration must be signed (not xeroxed) by the Director.

Note - no affidavit of execution is required for the owner or his agent as he is signing the application part of the Form only - not the certificate; No affidavit of execution is required for the Director even if he is a health unit or municipal employee as he is acting as an officer of the Government of Ontario pursuant to his designation in the contract between the Minister of the Environment and his employing Health Unit or Municipality and affidavits are not required for such officers - the Registry Act - section 25(2)(d).

REGISTRY ACT
Declaration Under Section 22 of the Act

I, JOHN SMITH, of the City of Owen Sound in the County of Grey, do solemnly declare that I am the owner of the following lands to which the attached Certificate of Approval refers:

(Insert description acceptable for registration)

I make this solemn declaration conscientiously believing it to be true and knowing that is of the same force and effect as if made under oath.

Declared before me
at the City of Owen
Sound this_________day
of _______________, 1982.

____
John Smith

____
A Commissioner, etc.

(Where the Certificate or Order requires the owner to register it, this affidavit should be completed by the owner or, with appropriate changes, the owner's agent or the Director. The affidavit is not necessary where the Certificate that is registered contains the full legal description - see section 4 of App. 3.3.1).
The conditions on the Certificate of Approval and the supporting reasons will be similar to those in the example of registration under the Land Titles Act as will the last page although the heading on the last page (cover sheet) will be "REGISTRY ACT".

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PERMITS

1 GENERAL

Section 67 of The Environmental Protection Act requires that no person shall use or operate a sewage system, or any part thereof, that has been constructed, installed, established, enlarged, extended or altered, unless a permit for its use or operation has been issued. The permit issued in connection with systems other than class 7 systems is called a Use Permit. For the issuance of a Permit, the terms and conditions of the Certificate of Approval must be fulfilled. No fee is charged for a Permit. A Use Permit is not required for Class 1, 2 or 3 sewage systems.

2 USE PERMITS

(a) Under normal circumstances, a Use Permit will only be issued when an inspector has conducted an inspection and determined that the system meets the conditions required by the Certificate of Approval.

(b) For sewage systems in Class 4 to 6 inclusive, the Use Permit is as shown at Appendix 3.4.1. The format is intended to serve as a record of the principal components of the system as they are actually installed. In most cases the Certificate of Approval will stipulate only tank size and length of distribution pipe but not, for example, the type of tank or distribution pipe to use. It is, therefore, only a partial record. The owner or his agent should provide the inspecting officer with at least 48 hours notice of readiness for the inspection.

(c) If the inspector finds conditions that are not acceptable in terms of the Certificate of Approval, instruction should be given regarding the adjustments or remaining work required. The form at Appendix 3.4.1 is only completed when all is satisfactory. Should there be minor, but acceptable, variances in the location or orientation of system components from that shown in the Certificate of Approval, the Use Permit form provides space on which to indicate the location of the "as-constructed" components in relation to fixed objects, so that they can be readily located if this is required in future.

(d) The inspection is conducted when the system is "open" so that the inspectors can check the pipes for proper jointing and gradient as well as determining that the size of tank, length of distribution pipe, layout and materials required in the approval have been installed, that meet the regulatory requirements where no divergence has been authorized and that good workmanship is in evidence. If all is found acceptable, the remaining work may proceed and the Permit may be issued. Such work as backfilling, shaping and dressing the slopes of raised beds, diverting surface or subsurface drainage from the bed area, grading, landscaping, seeding or sodding, that is required to complete the system to the standards and to meet any conditions of the Certificate of Approval, must be undertaken in accordance with the regulations, any conditions on the Certificate of Approval and good workmanship. The need for further inspection to assess whether or not such work has been completed satisfactorily will be determined by the inspector, based on his knowledge of the contractor and the nature of the remaining work.

(e) Refusal to issue a Permit will be unusual. Assuming the site inspection prior to issuing the Certificate of Approval was well performed, and the design as approved was the right one for the site conditions, it would only be circumstances unforeseen at approval stage that would require modification of the design during construction. Inmost cases there would be some means of overcoming unforeseen circumstances to the Director's satisfaction, and changes to the terms of the Certificate can be noted on the Permit Form.

3 PERMIT TO OPERATE A CLASS 7 SEWAGE SYSTEM

In the case of Class 7 sewage systems, a Permit to Operate at Appendix 3.3.3 is issued by the Director if the terms of the Certificate of Approval at Appendix 3.3.3 have been met to the Director's satisfaction.

4 CONDITIONS PLACED ON THE USE OF A SEWAGE SYSTEM

The Use Permit is the owner's authority to use the system as constructed. There is no provision in the Act for imposing conditions on a Permit, such as would limit the duration of the Permit, or make use of the

system dependent upon the completion of certain tasks or additional work. If, at the time of issuing a Use Permit, there is a need to impose conditions on the use of the system, these conditions must be imposed by amending the Certificate of Approval. After a Use Permit is issued, the Certificate continues to be in effect as the document stating what has been authorized. As an example, if it was desired to restrict the use of a system until such time as a sewer line was available for connection, the Certificate of Approval could bear such a condition and the approval would not extend beyond that time. The Use Permit would therefore only authorize use on those terms. As required by Section 121 (2)(c) of the Act, the owner must receive the reasons in writing and may appeal when an existing Certificate of Approval is altered in this manner.

5 APPEALS

Section 121 of the Act covers the requirement that a Director advise an applicant in writing of the reasons for refusing to issue a Permit, and provides for the right of appeal against such a refusal. Notice of appeal must be given in writing to the Director (who refused the permit) and the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ontario M4V 1K7, within 15 days of receipt of decision.

Ministry of the Environment
Ontario

USE PERMIT
FOR CLASS 4, 5, 6 SEWAGE SYSTEMS

		APPLICATION NO.
INSPECTION DETAILS	TIME DATE	WEATHER
REPRESENTING:	THE OWNER	THE INSTALLER

1. Work authorized by the Certificate of Approval has been satisfactorily completed and includes:

a) Septic tank/holding tank of working capacity of ______ Imp. Gals. constructed of steel ☐ concrete ☐ fibreglass ☐ on site ☐ or prefabricated ☐ to serve ______ (no. of bedrooms or units).

MAKE AND MODEL, IF PREFABRICATED TANK

b) Leaching bed of total ______ lineal feet of ____ inch diameter distribution pipe of ______ ______ (type and product description e.g. manufacturer(s) and material of which pipe is made) laid in _____ runs and fed by ______ (gravity, siphon, pump).

c) Proprietary Aerobic System: (Manufacturer) ______ (Model) ______

d) Other details ______

2. Location

a) System components installed as shown on application supporting Certificate of Approval ☐

b) If located other than in (a) use space below for sketch and dimensions from permanent points of reference sufficient to facilitate future location of tank and leaching bed including orientation of pipe runs.

3. The following work remains to be completed:—

☐ Backfill System and Complete

☐ Finish Grading to Shed Run-off and Divert Water Around Leaching Bed

☐ Stabilize All Sloped Surfaces

☐ Other ....

USE PERMIT

Under Section 67 of the Environmental Protection Act, and subject to the provisions of the Act and Regulations a Permit is hereby issued to (Owner) ______ for the use and operation of the Class ______ sewage system constructed/installed/enlarged/extended/altered persuant to the Certificate of Approval issued under the above application number in accordance with the application and Certificate of Approval with any changes indicated above and located on Lot ______ Concession ______ Ward/Township/Municipality ______ Region/District/County ______ Plan No. ______ Sub-Lot No. ______

INSPECTED AND RECOMMENDED BY	PERMIT ISSUED BY	DATE ISSUED
	DIRECTOR	

Note: Section 64(a) of the Act provides that no change can be made to any building(s) or structure(s) in connection with which this sewage system is used, if the operation or effectiveness of the sewage system will or is likely to be affected by the change, unless a new Certificate of Approval is obtained.

Section 121 of the Act provides that an applicant for a permit may appeal a decision to refuse to issue a permit. Written notice of appeal must be forwarded to the Director (who refused to issue the permit) and to the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ontario, M4V 1K7 within 15 days of receipt of a permit.

1042 3/82

OWNER

Care & Maintenance of a Sewage System

A sewage system which has been properly installed should, with proper care and maintenance, provide many years of service. There are, however, some things which you, the homeowner, should be aware of that will help the system to function properly. These are:

1. Do not allow roof drains to discharge to the septic tank or aerobic treatment plant, or surface waters to drain towards the area of the leaching bed.

2. Water usage in the home should be kept to a minimum. If automatic washers and dishwashers are used, make sure full loads are washed each time. Excessive use of water, such as doing numerous washings in one day, could flush solids from the tank to the leaching bed.

3. Moderate use of household drain solvents, cleaners, disinfectants, etc., should not interfere with the operation of the sewage disposal system, but indiscriminate use may cause problems.

4. There should be no need to use "starters", "bacterial feeds" or "cleaners".

5. !f roots penetrate and plug the tile, two or three pounds of copper sulphate crystals flushed down the toilet once a year should kill the roots it contacts. However, the use of copper sulphate should be carefully supervised since it may corrode chrome, iron and brass. Cast iron is not significantly affected. The crystals, when used in the above manner, should not disrupt the operation of the septic tank, but their use in a proprietary aerobic treatment plant should be cleared with the manufacturer.

6. The septic tank should be inspected at east once every two years and the tank pumped out when necessary; every three or four years is suggested. If the daily sewage flow exceeds 4500 Litres, regulation requires an annual inspection by a ticenced service man. Failure to pump-out a septic tank when required may result in sludge or scum being carried over to the leaching bed resulting in soil clogging arid complete failure of the system. .

7. Inspection, servicing Sand maintenance of a proprietary aerobic treatment plant and its related components in a Class 6 sewage system srall be carried out as required by the regulation and according to the recommendations in the manufacturer's operating and maintenance instructions.

8. Vehicular traffic (including snowmobiles) should not be allowed over the leaching bed.

9. The area over a leaching bed should have a good cover of grass but shrubs or trees should not be planted over the area. Good ventilation and adequate sunlight should be maintained in the area of the leaching bed.

10. Before any work commences on the building served by the sewage system, a certificate of approval must be obtained for any resulting work required on the sewage system, if the work contemplated on the building will effect the operation or effectiveness of the sewage, e.g. adding a bedroom. It is the owner's responsibility to contact the sewage system authority.

11. If a sewage system develops operating problems which are not being corrected under arrange ments made by the owner, such as pump-out, servicing or repairs by qualified persons, the system will be classified as a malfunctioning system and the owner must report the problem to the local Heaith Unit or Ministry of the Environment office.

Ministère de l'Environnement
Ontario

NUMÉRO DE DEMANDE

PERMIS D'UTILISATION POUR SYSTÈMES D'ÉVACUATION DE CLASSE 4, 5, 6

DÉTAILS D'INSPECTION	HEURE	DATE	CONDITIONS ATMOSPHÉRIQUES
REPRÉSENTANT:	LE PROPRIÉTAIRE		L'INSTALLATEUR

1. Le projet autorisé par le certificat d'approbation a été réalisé de façon satisfaisante et comprend:

a) une fosse septique/réservoir de capacité d'utilisation de ______ gal. imp. en acier ☐ béton ☐ fibre de verre ☐ fabriqué sur place ☐ ou préfabriqué ☐ pour desservir ______ (nombre de chambres ou d'unités).

MARQUE ET MODÈLE S'IL S'AGIT D'UN RÉSERVOIR PRÉFABRIQUÉ

b) un élément épurateur d'une longueur totale de ______ pieds de tuyau de distribution de ______ pouces de diamètre de ______ (type et description du produit, par exemple, constitué de ______ tronçons et fabricant(s) et matériau)

c) système aérobie privé: (Fabricant) ______ (Modèle) ______

d) autres détails ______

2. Emplacement

a) Les éléments du système sont installés de la façon indiquée sur la demande jointe à l'appui du certificat d'approbation ☐.

b) Si installé ailleurs qu'en a), faire un croquis coté ci-dessous avec des points de référence permanents permettant de localiser à l'avenir le réservoir et le lit de filtration, avec l'orientation des canalisations.

3. Les travaux suivants restent à terminer:

☐ Remblayer le système et terminer l'installation

☐ Stabiliser toutes les surfaces en pente

☐ Finir le nivellement jusqu'au point de branchement et faire passer l'eau autour du lit de filtration

☐ Autre ......

PERMIS D'UTILISATION

En vertu de l'article 67 de la Loi sur la protection de l'environnement et sous réserve des dispositions de la Loi et de ses règlements, un permis par les présentes est délivré à (propriétaire) ______ pour l'utilisation et l'exploitation du système d'évacuation de classe ______ construit/installé/agrandi/modifié en vertu du certificat d'approbation délivré sous le numéro de demande ci-dessus, conformément à la demande et au certificat d'approbation, avec tous les changements indiqués ci-dessus, et situé sur la parcelle no ______ concession ______ circonscription/canton/municipalité de ______ région/district/comté de ______ plan no ______ sous-parcelle no ______

INSPECTÉ ET RECOMMANDÉ PAR	PERMIS DÉLIVRÉ PAR	DATE DE DÉLIVRANCE
	DIRECTEUR	

Remarque: L'article 64a de la Loi stipule que toute modification à l'un des bâtiments ou structures auquel le système d'évacuation utilisé est relié doit être sanctionnée par un nouveau certificat d'approbation si le fonctionnement ou l'efficacité du système d'évacuation risquent d'être affectés par la modification.

L'article 121 de la Loi stipule qu'un requérant peut interjeter appel d'un refus de délivrer un permis. Un avis par écrit de l'appel doit être envoyé au directeur (qui a refusé de délivré le permis) et à la Commission d'appel sur l'environnement, 1 ouest, avenue St. Clair, Toronto (Ontario) M4V 1K7, dans les quinze jours suivant la reception de l'avis de décision.

1042F (3/82)

EXEMPLAIRE DU PROPRIÉTAIRE

Entretien et reparation d'un système d'évacuation

Un système d'évacuation bien installé devrait fonctionner sans ennu is pendant de nombreuses années pourvu qu'il fasse lobjet d'un entretien régulier. Les recommandatrons que contiennent les paragraphes suivants vous aideront a assurer le bon fonctionnement de votre système.

1. Veillez a ce que les tuyaux de gouttiere ne se déversent pas dans Ia fosse septique ou l'installation dé traitement aérobie, et a ce que les eaux de ruisseilenent ne s'écoulent pas vers le lit de filtration.

2 La consommation d'eau dans la maison doit être réduite au minimum. Si vous avez une machine a layer et un lave-vaisselle automatiques, veillez a layer a chaque fois une charge complete. Une consommation excessive d'eau, causée par exemple par des lavages répétés dans une journée, peut entralner les solides hors du reservoir dans le lit de filtration.

2. L'utilisation, modéréc do solvants domcctiqes pour conduites d'évacuation, de détergents, de désinfectants, ne devrait pas nuire au toactionnement du système d'êvacuation. Utilisés sans discernement, ces produits peuvent toutefois causer des problèmes.

4. Vous ne devriez pas avoir besoin d'agents d'amorçage, de produits nutritifs pour les bactéries ni de detergents.

5. Si des racines pénetrent dans le lit de filtration et I'obstruent, une fois par an, deux ou trois livres de cristaux de sulfate de cuivre entralnés par Ia chasse d'eau de la toilette devrait suff ire pour les tuer au contact. II convient cependant de faire preuve de prudence dans l'utilisation du sulfate de cuivre parce que ce produit peut attaquer le chrome, le fer et le laiton; il a peu d'effet sur Ia fonte. Si I'on utilise les cristaux de la facon indiquée ci-dessus, us ne devraient pas gêner le fonctionnement de Ia fosse septique. Avant de les utiliser dans une installation de traitement aérobie, vous devriez communiquer directement avec le fabricant afin de vous assurer qu'ils ne présentent aucun danger pour le système.

6. Il convient dinspecter la fosse septique au moins tous lea deux ans et de faire la vidange au besoin, par exemple tous les trois ou quatre ans. Si l'écoulement quotidien d'eaux usées exceed 4.500 litres, es reglements exigent que le système soit I nspecté tous les ans par un prépose a l'entretien autorisé. Si l'on neglige de vider le reservoir au besoin, des boues et des mousses peuvent être entrainées au lit de filtration oü elles peuvent obstruer le sol et emp6cher ainsi le système de fonctionner.

7. L'inspection, l'entretien et la reparation d'une installation de traitement aérobie de marque et de ses éléments connexes appartenant a un système d'évacuation de la classe 6 doit se faire de la manière indiquée dans le reglement et conformément aux recommandations contenues dans la notice de fonctionnement et d'entretien fournie par le fabricant.

8. Il faut empecher lea véhicules (y compris les motoneiges) de circuler au-dessus du lit de filtration.

9. Le sol au-dessus du lit de filtration devrait etre recouvert d'herbe, mais on ne doit pas y planter d'arbustes.ou d'arbres. II faut assurer une bonne ventilation et un bon éclairement naturel du sol recouvrant le lit de filtration.

10. Si les travaux prôjetés sur l'immeuble doivent toucher le fonctionnement ou l'efficacité d'un système d'évacuation (par exemple l'addition d'une chambre), avant d'entreprendre ces travaux sur un edifice dote d'un tel système, on doit obtenir un certificat d'approbation pour toutes les modifications qu'il faudra apporter au système. C'est au propriétaire de l'immeuble qu'incombe la responsabilité de communiquer avec les autorités compétentes.

11. Lorsqu'un système d'évacuation subit des problèmes de fonctionnement auxquels le propriétaire ne peut apporter de mesures correctives (par exemple en le faisant vider ou reparer par des proposes qualifies) le système doit être dana la catégorie des systèmes défectueux et Ie propriétaire doit signaler ce problème au Service de sante publique de la localité ou au bureau le plus proche du ministère de l'Environnement

PROVINCIAL OFFICERS

1 GENERAL

(a) Part XI of The Environmental Protection Act specifically relates to Provincial Officers and Sections 125 to 130 inclusive of the Act should be read by all personnel so designated. Important extracts are included hereunder. Provincial Officers must be designated in writing by the Minister and may be employees of the Ministry or other persons, .such as employees of municipalities performing functions of the Ministry by agreement. A Provincial Officer may survey from time to time anything that he has reason to believe is, or may be, a source of contaminant and, after completing such survey, shall make a report of his findings and recommendations.. The report shall be filed with the office responsible for delivery of the program under Part VII of the Act, and a copy served on the person responsible for the source of the contaminant. In the event that the report is to be used in support of a control order issued under section 6 of the Act it shall be filed with the Regional Director of the Ministry.

(b) When carrying out his functions, a Provincial Officer must be in possession of a valid identity card. The identity card, clearly states that the holder is a Provincial Officer. Each Provincial Officer should ensure that he has a current identification card. Directors and other individuals carrying out functions under Part VII of the Act who do not have a current identification card as a Provincial Officer may not enter private property against the wishes of the owner or occupant.

2 POWERS OF PROVINCIAL OFFICERS

(a) Section 127 of the Act authorizes a Provincial Officer to enter at any reasonable time (normally daylight hours) any building, structure, machine, vehicle, land, water or air to carry out investigations, tests and inquiries, including the examination of records and documents. It also requires every person, responsible for a source of contaminant, to furnish such information required for the purposes of the Act or the Regulation. If required, an order may be obtained from a Provincial Judge to gain entry for the purpose of conducting such surveys, and these must be carried out between sunrise and sunset unless the Judge authorizes some other time.

(b) If a Provincial Officer is obstructed from conducting an investigation, he is empowered to take such steps and employ such assistance as is necessary to accomplish what is required, including requesting the assistance of a member of the Police. Before taking action when obstructed, a Provincial Officer will consult with and obtain guidance from his immediate superior.

3 MATTERS CONFIDENTIAL

Section 130 of the Act requires that a Provincial Officer preserve secrecy in all matters that come to his knowledge in the course of a survey or investigation except for information in respect of the deposit, addition, emission or discharge of a contaminant. He shall not communicate any information such as secret matters to any person except:

(a) As may be required in connection with the administration of, or any procedures under, the Act and Regulation
(b) To his counsel
(c) With the consent of the person to whom the information relates.

ORDERS AND PROSECUTIONS UNDER PART VII OF THE ENVIRONMENTAL PROTECTION ACT.

1 ORDERS AND OFFENCES

(a) Orders - Section 68 of the Act outlines the circumstances under which a Director may make an order as follows;

"68(1) Where any person,

(a) constructs, installs, establishes, enlarges, extends or alters a building or structure referred to in section 64 or a sewage system and a certificate of approval required under section 64 has not been issued;

(b) constructs, installs, establishes, enlarges, extends or alters a building or structure referred to in section 64 or a sewage system and does not comply with any of the terms and conditions in a certificate of approval issued under section 64 in respect thereof;

(c) does not construct, operate, clean, empty, disinfect or maintain a sewage system in compliance with the standards prescribed in the regulations; or

(d) uses or operates a sewage system for which a permit required under section 67 has not been issued.

(e) constructs, established, installs, enlarges, extends or alters a building on or a structure on or in a parcel of land on or in which a sewage system is located, or alters a parcel of land on or in which a sewage system is located, so that the operation or effectiveness of the sewage system is impaired or is likely to be impaired.

the Director may make such order as he considers necessary in order to lessen or prevent the deposit, addition, emission or discharge of any contaminant into the natural environment.

(2) When a person to whom an order is directed under subsection 1 fails to comply with the order, the Director may cause the necessary work to be done and charge such person with the cost thereof which may be recovered with costs in any court of competent jurisdiction."

(b) Offences - Section 72 of the Act states:

'Any person who, in person or through an agent, representative or employee and any agent, representative or employee who contravenes any provision of this Part or the regulations or any order or fails to comply with any term or condition of a certificate of approval or licence issued under this Part is guilty of an offence and, on summary conviction is liable to a fine of not more than $1,000."

NOTE: The Environmental Protection Amendment Act, 1981, 5.0. 1981, c.49 provides for higher penalties and minimum penalties in certain circumstances.

2 PROSECUTIONS

(a) Charges may be laid when an offence occurs against the provisions of the Act or the Regulation or the terms and conditions of a certificate of approval or order. Section 68 of the Act (above) covers typical circumstances under which a charge may be laid as well as an order. A common example would be improper performance of work by a sewage hauler, either without a certificate of approval, or in a manner contrary to the terms and conditions of an issued certificate. Other examples would be where an owner fails to operate and maintain a sewage system in compliance with the provisions of sections 4, 10(5) and 12 of the Regulation.

3 STATUTE OF LIMITATIONS

Charges for contravention of Part VII of the Act must be laid within two years after the violation occurs. The violation may be of a continuing nature, such as the operation of a sewage system without a Use Permit when one is required by regulation. In such cases it is important that the evidence in support of the violation be obtained within the two year periods before charges are laid. (For offence which occurred prior to December 3rd, 1981, when the Environmental Protection Amendment Act, 1981 came into force the limitation period was six months.)

4 OFFENCE NOTICES UNDER THE PROVINCIAL OFFENCES ACT

(a) Offence Notices may be issued under authority of the Provincial Offences Act. The regulation under that Act provides for the use of Part I (Offence Notice procedures) for special offences under Part VII of the Environmental Protection Act and Ontario Regulation 374/81. Offence Notices are the equivalent of the speeding tickets which were issued on the spot to drivers under the former Summary Convictions Act. They permit guilty pleas and the payment of fines without a court appearance.

(b) Schedule 38 of Part I of Regulation 308 under the Provincial Offences Act contains short form wordings to describe offences under Part VII of the Environmental Protection Act and Schedule 52 provides short form wordings for offences under Ontario Regulation 374/81.

(c) The Provincial Offences Courts have established set fines of $78 or $153 for particular offences for payment out of court by persons to whom an offence notice has been issued who wish to plead guilty.

(d) An individual is not empowered to issue an Offence Notice unless he (or she) is a Provincial Offences Officer. All persons in agencies delivering the private sewage program who have been designated as a Provincial Officer by the Minister are also Provincial Offences Officers for purposes of Part VII of the Act pursuant to a designation signed by the Minister.

(e) The amount of fines and assistance in all matters relating to Offence Notices can be obtained from the Ministry's Special Investigation Unit (SIU) officer at each Regional Office.

5 LEGAL ASSISTANCE

Legal assistance to members of municipalities or Health Units administering the private sewage program will normally be obtained from their own solicitors. It is obvious that a poorly or improperly worded charge or order will not be effective. The solicitors of the Ministry's Legal Services Branch are prepared to discuss with members of Health Units, or their lawyers, the wording of charges, orders, conditions, etc., and what penalties might be requested, or evidence needed, in a prosecution, appeal or hearing. In exceptional cases, if time is available, members of the Branch may provide counsel for a hearing or trial.

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CHAPTER 4

5

CHAPTER 5

SEWAGE

CHAPTER 5

SEWAGE

SEWAGE GENERAL

Sewage includes wastes of domestic origin such as human body wastes, toiletwastes or other bathroom waste, waste from other showers and tubs, liquid or water-borne culinary and sink wastes, laundry waste, and such other waste as is suitable for treatment in a sewage system regulated under Part VII of the Act.

2 DOMESTIC SEWAGE

(a) Domestic sewage is approximately 99.9% liquid and 0.1% solids and half the solids are biodegradeable organic matter, whereas the other half is inorganic material such as grit and sand. The sewage may contain small quantities of oil, grease and synthetic compounds and it has an average 5 day biological oxygen demand (BOD_5) of 200 $\pm$ mg/l.

(b) The primary concern of health authorities and ecologists is the presence in sewage of toxic elements, disease carrying bacteria, and nutrients in the form of nitrogen and phosphorus compounds.

(c) Domestic sewage may be described under the headings of condition, concentration and composition as follows:

(i) Condition - refers to the age of the sewage such as:

- Fresh - when the oxygen demanding processes of decomposition have yet become evident.

- Stale - when the dissolved oxygen content has been depleted to near zero by biological degradation and,

- Septic - when biodegradation has set in, and a population of organisms in scale with the food supply has been established.

(ii) Concentration - refers to the strength of the sewage, usually measured by its 5-day 20^o BOD. BOD concentration can vary considerably between one sample and another. The average for domestic sewage would be from 200 to 250 mg/l.

(iii) Composition - refers to its content of various waste-contributed quality factors, oxygen demanding potential and products of biodegradation.

(d) Of the nutrients in domestic sewage, it is generally believed that the phosphorus compounds are the important ones. Prior to the Federal Government reduction in the phosphate levels (P_20_5) of detergents from 20% to 5% in 1973, it was considered that the average household sewage contained about 0.8 kilograms of phosphorus (P) per person per year, of which about one half was from human waste. In the future, therefore, the human waste can be assumed to contribute the major portion of the total amount of phosphorus in domestic sewage.

3 LAUNDROMAT WASTE

(a) The waste from laundromat operations contains dirt, lint, grease and other contaminants in suspension, and colloidal dispersion and the synthetic surfacants in solution. Treatment of this waste in a septic tank is not likely to produce an effluent that could be disposed in a leaching bed without causing problems. The nature of the effluent is such that the leaching area becomes lined with a dense, slimy gelatinous material resulting in rapid clogging 0f the soil.

(b) Disposal of laundromat wastes in septic tanks can be considered where such wastes are minor in quantity and are mixed with large amounts of domestic wastes. An estimate of 20% of the total flow should not be exceeded. For example, a laundromat facility in a tent and trailer park, with its use confined to the occupants of the park, would be acceptable if the domestic sewage goes into the same septic tank as the laundromat waste, and the latter was not more than 20% of the total.

4 COMMERCIAL KITCHEN WASTE

The waste from commercial kitchens may contain large quantities of grease which build up and eventually pass through the septic tank and plug up the leaching bed. The life of the leaching bed may be extremely short unless a grease trap is installed in the waste pipe between the kitchen and the septic tank, and is cleaned periodically.

5 SLAUGHTERHOUSE WASTES

Although slaughterhouse wastes are similar to domestic sewage in chemical composition, they are characterised by high organic, highly nitrogenous and biologically degradable suspended and dissolved solids and grease in relatively high concentrations. The characteristics and volume of the waste depend on the size of the plant and the quality of the housekeeping and operation of the plant. In general, septic tank/leaching bed systems are not suitable for even the small slaughterhouse operations. It is recommended that the waste from such operations be collected in holding tanks, and that the tanks be pumped when necessary and the contents be disposed in a approved manner.

6 OTHER WASTES

From time to time a question is raised about the ability of a private sewage system to treat a specific form of waste without damage to the sewage system or its operation and without impairment of the ground water. If assistance is needed in assessing the acceptability of such wastes in a sewage system it may be obtained from Applied Sciences Section (416) 248-3044) or from the Private Sewage Unit ((416) 965-6967). The questioner should have the following information available.

(a) A full description of the questionable waste.

(b) The daily or periodic quantity of the waste.

(c) The volume or amount of the water in relation to other forms of sewage fed into the system. Small quantities may be acceptable whereas large quantities would not.

(d) The type of sewage system.

SEWAGE AS A HEALTH HAZARD

1 Domestic sewage may contain up to 20 million organisms per millilitre. The feeding activities of some of these organisms result in the biodegradation of the sewage. Some of the bacteria in domestic sewage may be pathogens, but their number is small in comparison with the total microbial population. However, the fact that pathogens are present in sewage makes sewage disposal of prime concern to public health agencies.

2 Pathogenic organisms found in sewage can infect man if such organisms contaminate water supplies used for drinking purposes or for washing or bathing purposes. The chance for infection is much greater when the water is consumed.

3 The pathogenic organisms can be transported by flies, rodents, etc., and may be absorbed through the skin. Man may also infect himself directly as a result of low personal hygiene standards.

4 Some of the pathogenic organisms which may be present in sewage are causative agents of typhoid, paratyhoid, cholera, gastroenterites and dysentry.

5 Because of the danger of contraction of disease from pathogenic organisms, all health agencies recommend chlorination of surface water supplies. They also recommend chlorination of ground water supplies as a precaution when such supplies are municipally distributed to large numbers of people.

SEWAGE CAUSES ENVIRONMENTAL DETERIORATION

1 Sewage discharged into a lake or other body of water can have a profound effect on the ecosystem of the lake. The temperature of the sewage influences the rate of biological activity and the solubility of oxygen and other gases. Turbidity caused by sewage excludes sunlight and thus reduces the growth of oxygen-producing plants.

2 The degradation of organic matter in domestic sewage uses up the dissolved oxygen in the receiving waters, and thus reduces the oxygen level, especially at the bottom level. If the dissolved oxygen is not replaced as rapidly as it is depleted, aerobic decomposition eventually will give way to anaerobic decomposition, and this is accompanied by the production of gases, such as ammonia and hydrogen sulfide. This is the situation that exists in facultative lagoons in the pring for a short period of time after the ice melts, since, during the ice covered months, the dissolved oxygen in the lagoon waters is not being replaced at the rate it is being consumed.

3 While sewage causes environmental deterioration due to the decomposition of its organic matter, of greater importance from the environmental point of view is the impairment it causes by the addition of nutrients to the receiving waters.

4 The relative importance of nutrients from sewage systems as a contributor to degradation of lake quality varies with the type of activity in the lake watershed. Intensive farming with high usage of artifical fertilizers, such as in the Holland Marsh, is likely to be a far greater contributor of nutrients to Lake Simcoe than the private sewage treatment facilities surrounding the lake, whereas, in the Precambrian Shield, where the only activity in a lake watershed is recreational, the waste from cottages could be a significant contribution unless properly controlled. The degree to which such sewage contributes to degredation of the lake quality in relation to other sources of contamination will vary from lake to lake, and particularly with the characteristics of the lake and the number of contributors. The point is that it is controllable, and this is one of the principal reasons for regulation. However, a forest fire in the same watershed, followed by soil erosion, may do far more damage to the lake than years of nutrient input from cottage sources.

5 The following article, which appeared in the press, gives a comprehensive description of deterioration of lakes from excessive nutrients.

"WHY LAKES BECOME GREEN AND SLIMY’’

A lake is a water-filled hole caused by some geological accident such as gouging out by ice, blocking of a valley by a landslide or a moraine, or even by a dam. It fills with water by drainage from the surrounding land directly, and usually also via streams, and most of the precipitation falling on to the watershed either reaches the lake or is evaporated. However, in areas where the rocks are porous a fair amount may percolate down into the watertable, and some or all of this may never reach the lake. This would be unusual in Ontario's cottage country where the rocks are mostly hard and crystalline. Most lakes have an outflow stream, but from some the water leaves by seepage into the water table or through a moraine.

In dry areas, such as the Prairies, the rate of evaporation may be so high that the basin never fills to overflowing, and the lake becomes steadily saltier as it retains everything that comes in except the water. Where there is outflow or seepage most of the salts go out again in solution. The inflowing water brings in silt, twigs, dead leaves and other debris, and this all settles out in the basin and slowly fills it, so all lakes disappear in time. In fact most of them last only for a few, or a few tens of thousands of years, and the reason that we now have so many in Canada is the recent geological activity of the Ice Age.

In areas such as the central and southern United States, where no recent large geological cataclysm has occurred, natural lakes are rare. Any activity in the watershed of a lake that causes soil erosion greatly increases the rate of filling up, and almost everything men do, including building, plowing, clearing the forest and making roads, belongs in that category.

Water is a very strange material and has properties that it shares with few other liquids. Not only will it dissolve almost everything, but it becomes lighter when it freezes (ice floats but almost everything else sinks when it becomes cold enough to freeze). It is at its densest when

it is at 4 degrees Centigrade (39.2 degrees Fahrenheit) and becomes lighter when it is warmer or colder than this (other liquids become denser as they get colder). These thermal properties have the very important consequence that ice forms on the surface of lakes and has much warmer water (up to 39.2 degrees Fahrenheit) a few inches below it. Also, the surface water in a deep lake warms up in summer time. This water, being less dense, lies on top of a layer of denser, much cooler water. The result is a thermal discontinuity at a certain depth - we call it thermocline - above which the water is stirred and circulated by the wind, and below which it has no contact with the air all summer long. Just how deep the thermocline lies depends on a number of things, but, generally speaking, it is deeper in large and more exposed lakes than in small or sheltered ones. Somewhere between 20 and 40 feet would be fairly typical for many lakes in Ontario's cottage country.

Plants and algae, which are just microscopic plants, grow by using the energy of light to convert carbon dioxide and water into organic matter, but they also need the so-called nutrient salts to incorporate into necessary organic compounds. The three most important of these are nitrate, phosphate and potassium. The others, which include iron, calcium and magnesium, are needed in much lesser amounts and, as they are usually amply available in natural water, they do not concern us further here. Any particular species of plants needs the three principal nutrients in a fairly definite ratio, so a shortage of any one of them (or of carbon dioxide or water) limits its growth. Addition of more of the limiting nutrient increases growth, but addition of more of the others has little effect.

On land, any one of the three may be limiting to certain plants - we fertilize fruit trees with potassium and lawns with nitrate -but in lake water phosphate is the most usual culprit and addition of phosphate nearly always enhances algal growth. Where, however, algae are already very dense, the plants may run out of carbon dioxide, or bicarbonate (limestone in solution) which they can also use, or light as they shade one another out. But by that stage the lake is already in a poor way. The reasons why phosphate is the most usual limiting factor in fresh water are complex, but with some oversimplification we can say that it is relatively scarce anyway and, unlike the other two, on land it is tightly bound into the soil, so it does not leach out so readily. About as much nitrate and potassium leave a lake via the outflow as leach into

it, but phosphate, which mostly comes in on soil particles and dead leaves, etc., remains in the lake. This is because it is very rapidly taken up by bacteria and plants, even far in excess of their immediate needs, and because, as in soil, it readily becomes bound into the mud when oxygen is present. When oxygen is absent the phosphate is released again and is rapidly taken up by the algae, and when they die and decay it is released again to be recycled again and again, so it is effectively trapped in the lake.

The fact that the phosphate is bound into the soil points up the significance of soil erosion, and the thermal properties of water ensure that twice in each year the mud and overlying water are cut off from the atmosphere - below the ice and below the thermocline. It will be clear, therefore, that twice in each year there is a risk of deoxygenation at the mud-water interface if there is a great deal of organic matter to decay. Water at normal temperatures dissolves a little oxygen, about 10 mg/L by weight, which is enough for aquatic animals. It gets it either from the atmosphere or from the plants and algae growing in it. In fact, the ultimate source of all oxygen is from growing plants; they produce it, they do not use it, and in summer well-fertilized lakes give it off to the atmosphere. However, when plants die and decay, or are eaten and digested, or are prevented from growing by lack of light, they can ultimately use up the same amount of oxygen as they produced when they were growing, and they also once more release into circulation the nutrient salts and the carbon dioxide they had taken up.

Eating and digestion go on all the time everywhere, and some use of oxygen by living plants occurs every night. However, in the dark of winter under the ice, and in summer below the thermocline, oxygen is progressively used up all the time and it cannot be replenished from the atmosphere. Therefore, in a lake which grows a lot of algae because it is well fertilized, there tends to be deoxygenation in winter under the ice - remember it is relatively warm there, so decay goes on all the time. Similarly, in the summer, in the deep dark layers below the thermocline, decaying algae abound in enriched lakes and the supply of oxygen is soon exhausted.

Deoxygenation has two consequences. It suffocates animals, for example, the winter-kill of fish, and it releases phosphate much more readily from the mud. It therefore escalates the effects of enrichment with

phosphate. That is why lakes so often suddenly begin to produce offensive blooms of algae after many years of apparently satisfactory occupation by cottagers. Slowly over the years the fertility is built up and then the critical point is attained when, during the winter, or below the thermocline in the summer, the oxygen content of the water at the mud-water interface falls to a level low enough to release large amounts of locked in phosphate. Then when the water again mixes freely, at the thaw or in the fall, it all comes welling up and the algae bloom enormously. That is almost a point of no return as the system is self-sustaining – more algae, less oxygen near the mud, more phosphate, more algae and so on. Of course, this cycle may not lope into an unfaltering stride from the start; a short winter, a late Spring or an early Fall may check it for a year, or even two or three, but once begun it is on its way and we have no effective means of checking it.

To prevent any further addition of phosphate would help, hence all the fuss about detergents; and in time, presumably, enough would be lost from the system through the outflow and perhaps deep into the mud to break the cycle. But we really have no idea how long “in time" may be; we do know that obviously lake mud in general equilibrium with the water normally contains about 1,000 times as much phosphate as the water, so enriched mud can fertilize a great deal of water. Actually, of course, there is usually much more water than mud, and there are indications that only the upper layers of mud are able to give up their phosphate. But there is some uncertainty about this and the mud is usually many feet deep. Twenty feet is not uncommon in Southern Ontario.

Finally the average cottager wants not only to boat and swim, he also likes to fish, and here again excessive enrichment works against him. Theoretically, and actually in practice also, extra fertilization leads to more plant growth and this to more insects, worms, etc. for fish to eat, and hence to more production of fish. That is fine, up to a point. Indeed, unproductive lakes have often been fertilized with phosphate and other nutrients arid to increase their yield of fish, and the fish farmers of Asia and Africa add all kinds of materials to their ponds to increase production.

PRIZED LAKE FISH

Unfortunately, however, from our point of view here, beyond that certain point, the production is of the wrong kind. Our most prized lake fish is the trout, which does best in nutrient-poor waters. Trout also cannot stand high temperatures, so in summer they retreat into the cool water below the thermocline. But, once the lake is sufficiently enriched for the water there to be seriously deoxygenated, they are between high temperature and suffocation, and that soon puts an end to them.

Similarly, bass and the sunfish thrive best in reasonably rich water, but, as the fertility increases and algae become more common, they are replaced first by perch and then by sucker and carp. People then say that the lake is dead. It isn't, of course; it is more alive than it has ever been in terms of production of algae, insects and fish but they are all of the wrong kind. The algae float in insightly scum, blanket weed coats submerged objects, clouds of (non-biting, but nasty) midges emerge and fat suckers and carp wallow in the soup. Moreover, it smells unpleasant and real estate values plummet."

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CHAPTER 6

SOILS

CHAPTER 6

SOILS

IDENTIFICATION AND CLASSIFICATION OF SOILS

1 MEANING OF "SOILS"

Soils used in an engineering sense, are that portion of the earth's crust which is fragmentary, or such that some individual particles may be readily separated by the agitation in water of a dried sample. Soils are composed chiefly of solid particles derived from the physical and chemical weathering of rock plus varying amounts of moisture, organic matter, air and other gases. Soils can be further modified when they are exposed to the. influences of weather, temperature, biological activity and other factors.
If the products of rock weathering are still located at the place where they originated, they constitute a residual soil. Otherwise they constitute a transported soil, regardless of the agent which performed the transportation.

2 PHYSICAL PROPERTIES OF SOIL

(a) Soils possess physical properties which greatly influence their ability to accept and transmit liquids. Recognition of these properties is most important in determining the suitability of a soil for use in a soil disposal sewage system. The important physical properties are:

(i) Texture
(ii) Structure
(iii) Consistency and Sensitivity
(iv) Plasticity - Atterberg Limits (v) Clay mineralogy
(vi) Shrinkage Limit and Liquidity Index
(vii) Colour
(viii) Soil profile, stratification and soil horizons.
(ix) Bulk density

(b) In the following sections each of these properties, and the manner in which they influence the absorption and passage of liquids through the soil, are discussed.

3 SOIL TEXTURE

This refers to the relative proportion of the various sizes of solid particles in the soil. It is important because of its close relationship to pore size, pore size distribution and pore continuity, and their influence on permeability, aeration and drainage. Various methods have been adopted by different agencies for the classification of soils into categories according to soil texture. The Unified Soil Classification System (USCS) is the system used in this Manual. It groups soils into the three major divisions of coarse-grained, fine-grained and organic. A chart showing these divisions, and soil classifications within these divisions is shown in App. 6.1.1. Once the grain size has been determined it may be plotted on a chart such as is shown in Appendix 6.1.2. Appendix 6.1.3 shows various classifications by other agencies. The one used by the U. S. Bureau of Reclamation is the same as the USCS. The U. S. Department of Agriculture's system is graphically shown in Appendix 6.1.4. The principle divisions of the USCS are further discussed as follows:

(a) Coarse-grained soils are those soils made up largely of particles visible to the naked eye and are further subdivided as follows:

- (i) Boulders - particles larger than 200 mm
- (ii) Cobbles - particles 76 to 200 mm
- (iii) Gravel - particles smaller than 76 mm and larger than No. 4 sieve (approx. 5mm)
- (iv) Sand - particles less than No. 4 sieve and larger than No. 200 sieve (0.074 mm).

(b) Fine-grained soils are made up of particles not distinguishable to the naked eye (particle size less than No. 200 sieve), and are identified as silt or clay by their behavior, as follows:

- (i) Silt - Particles between 0.074 mm and 0.002 mm exhibit dilatancy (reacts to shaking test by appearance of moisture on the surface which dries rapidly when sample is at rest). Powders easily when dry and has little strength. Gritty to the teeth. No shine imparted when moist and stroked with knife blade.

(ii) Clay - Particles less than 0.002mm. Not dilatant. Possesses appreciable dry strength. Sticks to fingers when moist. Not gritty. Shines when stroked with the knife.

(iii) Various names are applied to types of fine grained soil which may be encountered. Some of these are:

- Silt - a fine grained soil with little or no plasticity. The less plastic varieties generally consists of more or less equidimensional grains of quartz, sometimes called rock flour. More plastic types contain an appreciable percentage of flake shaped particles.
- Clay - an aggregate of microscope and submicroscopic particles, derived from the chemical decomposition of rock constituents. It is plastic within a moderate to wide range of water content. Dry specimens are very hard. Permeability is extremely low.
- Tuff - fine grained water or wind laid aggregate of very small mineral or rock fragments ejected from volcanoes.
- Loess - A uniform cohesive light brown windblown sediment.
- Diatomaceous earth.- fine, generally white, siliceous powder composed of the remains of diatoms or microscopic unicellular marine or fresh water algae, characterized by silicified cell walls.
- Marl - various fairly stiff, or very stiff, marine calcereous clays, usually greenish in colour.
- Varved clay - alternating layers, of medium grey inorganic silt and darker silty clay. Layers generally not more than 12 millimetres thick. The constituents were transported into fresh water lakes by glacial melt water.
- Bentonite - a clay with a high content of montmorillonite, generally formed by the chemical alteration of volcanic ash.

(c) Organic soils are chiefly formed in-situ, either by the growth and subsequent decay of plants such as peat mosses, or by the accumulation of fragments of the inorganic skeletons or shells of organisms. Hence a soil of organic origin can be either organic or inorganic. The term "organic soil" ordinarily refers to a transported soil consisting of the products of rock weathering with a more or less visible admixture of decayed vegetable matter. Depending on particle

size, the term "organic" may be used as an adjective to describe soils in which there is an organic content e.g. organic silts and organic clays.

(d) Till is an heterogeneous glacial deposit of clay, silt, gravel and boulders in various proportions.

4 STRUCTURE

(a) Structure refers to the aggregation of soil particles into clusters of particles, called peds, that are separated by surfaces of weakness. It has a significant influence on the soil's acceptance and transmission of water. The surfaces of weakness open planar pores between the peds and are often seen as cracks in the soil.

(b) The form, size and stability of the aggregates or peds, depend on the arrangement of the soil particles and the bonds between the particles. A soil with a strong structure will have distinct pores between the peds. Common adjectives used to describe the structure of soils are "stratified", "fissured", "lensed", "friable", "platy", "massive", "prismatic", "blocky", "granular". These may be further described as follows:

Stratified	-	Layered, e.g. thin sand seams embedded in a clay or silt layer.
Fissured	-	Soils with small joints and cracks.
Lensed	-	e.g. soil with small pockets of sand in a clay or silt layer.
Friable	-	easily crumbled.
Platy	-	Particles arranged around a plane, generally horizontal.
Massive	-	Clay soil with a very weak structure with no peds or planes of weakness.
Prismatic	-	Prismlike peds with greater vertical than horizontal dimension - vertical faces well defined - vertices angular.

Blocky - Peds shaped like blocks or polyhedrons having plane or curved surfaces that are casts of the molds formed by the surfaces of surrounding peds. May be angular (faces flattened, sharply angular vertices) or subangular (mixed rounded and angular).

Granular - Sandy soils with weak structure without peds or planes of weakness. Also called "single grained".

(c) Voids between the peds are often relatively large and continuous compared to the voids or pores between the primary particles within the peds. The type of structure determines the dominant direction of the pores and, hence, water movement in the soil. Platy structures (clays) restrict vertical percolation of water because cleavage faces are horizontally oriented during the process of sedimentation. Blocky and granular structures enhance flow both horizontally and vertically.

(d) Structure is one soil characteristic that is easily altered or destroyed. The structure of soils, particularly those containing clay can be changed radically by the addition of water and by mechanical working. In the dry state clay plates are strongly attached together giving the soil a hard consistency which is very stable and able to resist high forces. When water is added the clay plates surround themselves with water. If sufficient water is added it becomes a lubricant and the clay enters a plastic state with the consistency of putty. To avoid drastically changing the permeability of clay or clayey soils it is most important to:

- Avoid compacting native clay soils in the leaching bed area during construction activities at the site.
- avoid work in fine grained soils under conditions of high moisture content.

5 CONSISTENCY AND SENSITIVITY

(a) Consistency - The term consistency refers to the degree of adhesion between the soil particles and to the resistance offered against forces that tend to deform or rupture the soil aggregate. The consistency of clays and other cohesive soils is usually described

as "soft', "firm or medium", "stiff" and "hard". In terms of compressive strength (unconfined) the following tabulation indicates the strength represented by the descriptive adjectives:

Consistency	Unconfined compressive strength kPa
very soft	less than 25
soft	25-50
medium	50-100
stiff	100-200
very stiff	200-400
hard	over 400

*Note: Tabulation from Terzaghi and Peck converted to SI units and rounded off.

(b) Remolding - Clays share with many other colloidal substances the property that kneading or working at unaltered water content makes the material softer. This process can be called remolding. A dry clay cannot be remolded as under mechanical stress it becomes friable and breaks into small fragments. As the moisture content increases to the point where the clay becomes plastic, kneading or working can break down the structure so that the plates become detached from one another. The result is a remolded or puddled clay. A clay in this state may well be altered in its ability to transmit water. Soils containing minerals that shrink and swell appreciably such as montmorillonite clays, show the most dramatic change for the worse. THIS EMPHASIZES THE IMPORTANCE OF NOT DISTURBING AND REMOLDING (e.g. Smearing) CLAYEY SOILS DURING THE CONSTRUCTION OF SEWAGE SYSTEMS.

(c) Sensitivity - Some remolded clays are rated a sensitive if the remolding has changed their compressive strength in relation to that, at the same moisture content, of the clay as it was laid by sedimentation. The greater the drop in strength after remolding the higher the sensitivity. Some clays may become "quick" perhaps due to their structure or to leaching of soft glacial clays deposited in salt water and subsequently uplifted. Some clays in the St. Lawrence lowlands are examples of highly sensitive clays.

6 PLASTICITY - ATTERBERG LIMITS

After a cohesive soil has been remolded, its consistency can be changed at will by increasing or decreasing the water content. Thus, if the water content of a clay slurry is reduced, the clay passes from a liquid state through a plastic state and, finally, into a solid state. The water contents at which different clays pass from one of these states to another are very different and can be used for identification and comparison of clays.

(a) The Liquid limit (w_L) is the water content in percent of any weight at which the liquid state becomes the plastic state. It is determined in the laboratory by a test described in Article 4.

(b) The Plastic limit (w_P) is the water content at the lower limit of the plastic state at which the soil begins to crumble when rolled out into thin threads. Below this limit a soil cannot be remolded.

(c) The Plasticity Index (I_P) is the difference between the liquid limit and plastic limit and is a measure of the range of moisture content over which a soil is in the plastic state. The higher the index, the more plastic the clay, and the more resistive it becomes to the transmission of water. Appendix 6.1.5 shows a modified plasticity chart for the fine grained soil types in the Unified Soil Classification System.

7 CLAY MINERALOGY

The mineralogy of clay present in the soil can have a very significant influence on water movement. Some clay minerals shrink and swell appreciably with changes in water content. Montmorillonite is the most common of these swelling clay minerals. Even if present in small amounts, the porosity of soils containing montmorillonite can vary dramatically with varying moisture content. When dry, the clay particles shrink, opening the cracks between peds. But when wet, the clay swells closing the pores. The greater the swelling, the higher the plasticity.

8 SHRINKAGE LIMIT AND LIQUIDITY INDEX

(a) The Shrinkage Limit (w_3) is the water content below which further loss of volume by evaporation does not result in a reduction of volume of the soil. As a soil passes below this limit it becomes slightly lighter in colour. The shrinkage limit of a soil may be obtained for either an undisturbed or a remolded sample. The difference in the result may be an indication of the amount of "natural" structure a soil possesses.

(b) The Liquidity Index (I_L) or "water-plasticity ratio" is the ratio of the difference between the natural water content (w) and the plastic limit to the plasticity index and is expressed by the formula.

$$I_L = \frac{w - w_p}{w_L - w_P} = \frac{w - w_P}{I_P}$$

If the natural water content exceeds the liquid limit, the liquidity index will exceed 1.0. Its remolding strength is then less than the very small amount existing at the liquid limit. Any remolding will turn it to a slurry. Such clays are sometimes called "quick". The Leda clays of Eastern Ontario are in this category. If the natural water content is less than the plastic limit (I_L negative), the soil cannot be remolded.

9 COLOUR

(a) The colour and colour patterns in soil are good indicators of the drainage characteristics of the soil. Soil properties, location in the landscape, and climate, all influence water movement in the soil. These factors cause some soils to be saturated, or seasonally saturated, affecting their ability to absorb wastewater. Soil colours are a result of the colour of primary soil particles, coatings of iron and manganese oxides, and organic matter on the particles. Soils that are seldom or never saturated with water and are well aerated, are usually uniformly red, yellow or brown in colour. Soils that are saturated for extended periods, or all the time, are often grey or blue in colour, although such colouration does not necessarily mean a saturated soil. An unoxidized parent soil is often grey or bluish in colour.

(b) Soil mottling

(i) Soils that are saturated, or nearly saturated, during portions of the year often have spots or streaks of different colours, mostly grey or red, called mottles, which indicate zones of saturated soil that may occur only during wet periods. Mottles result from chemical and biochemical reactions when saturated conditions, organic matter, and temperatures above 4^{o} c, occur together in the soil.

(ii) The mottling process can be explained by assuming the presence of a brown soil horizon in which the brown colour is formed by finely divided iron particles spread throughout the horizon. Assume the soil becomes saturated with water. Under these conditions, the bacteria present rapidly deplete any oxygen present while feeding on the organic matter. When the oxygen is depleted, other bacteria continue the organic decomposition, using the oxidized iron and manganese compounds, rather than oxygen, in their metabolism. Thus, the insoluble oxidized iron and manganese, which contribute much of the colour to soil, are reduced to soluble compounds. This causes the soil to lose its color, turning the soil grey. When the soil drains, the soluble iron and manganese are carried by the water to the larger soil pores. Here they are reoxidized when they come in contact with the oxygen introduced by the airfilled pores, forming insoluble compounds once again. The result is the formation of red, yellow and black spots near surfaces, and the loss of colour, or greying, at the sites where the iron and manganese compounds were removed. This sequence can be repeated each time the soil in this horizon is saturated. The reason that the process is not reversed when the soil is resaturated is due to the fact that the very finely divided iron in the brown soil dissolves much more easily than the relatively large concentrations of iron forming the spots.

(iii) While mottling indicates periodic saturation in most cases, lack of mottles does not always indicate lack of saturation. For example, periodically saturated red clays do not show mottles; or one of the conditions needed for mottle formation is not present. Also, colour spots and streaks can be present in soils for reasons other than soil saturation. For example, soil parent materials sometimes create a colour pattern in the soil similar to mottling, but these patterns usually can be distinguished from true mottling. Some very sandy soils have uniform grey colours because there are no surface coatings on the sand grains. This colour can mistakenly be interpreted as the grey colour indicative of frequent saturation and poor draining. Direct measurement of zones of soil saturation may be necessary to confirm the soil moisture if interpretation of soil colours is not possible.

10 SOIL PROFILE, STRATIFICATION AND SOIL HORIZONS

(a) The term "soil profile" indicates a vertical section through the subsoil that shows the thickness and sequence of the individual strata.

(b) The term "stratum" is applied to a relatively well-defined layer of soil in contact with other layers of conspicuously different character. If the boundaries between the strata are more or less parallel, the soil profile is said to be "simple" or "regular", but if they constitute an irregular pattern, the soil profile is "erratic".

(c) To a depth of about 1.8 metres from ground surface a soil deposit is influenced by seasonal changes of moisture and temperature in addition to such biological agents as roots, worms and bacteria. The result is the formation of soil horizons as distinct from the separate strata referred to above. These horizons are:

(i) "A" Horizon - The horizon or zone of maximum weathering. It includes the Al zone which is top soil containing organic material and the A2 zone which is a leached zone from which water percolation has removed soluble minerals. The "A" horizon is normally within the first 0.3 metres of depth.

(ii) "B' Horizon - The zone in which the fine material, leached from the "A" horizon, is deposited. It is usually recognized by the brown colour resulting from the presence of iron oxides such as limonite.

(iii) "C" Horizon - The zone of the parent soil unaltered by percolating surface waters. Generally grey in colour.

(d) As each stratum has its own set of characteristics. As the boundary conditions can significantly influence waste water treatment and flow through the soil, a complete investigation should consider the physical properties of all the stratum that influence absorption and treatment of the wastewater.

11 DENSITY

Density can significantly influence water infiltration and percolation in soils. Soil density is the ratio of the mass of soil to the volume occupied by the soil mass and pore space. There is no direct correlation between density and soil permeability, since sandy soils generally have a higher density and permeability than clayey soils. However, of soils with the same texture, those soils with the higher densities will have less pore volume and are more compact. Reduced porosity reduces the hydraulic conductivity of the soil. Fragipans are examples of horizons that have high densities and reduced permeabilities. They are very compact horizons rich in silt and/or sand but relatively low in clay.

12 FIELD IDENTIFICATION PROCEDURES FOR SOILS

An experienced technician can achieve a reasonably accurate identification of soils by visual inspection, "touch and feel", and some simple tests. Examination and, in some cases, tests can be carried out to assess the soil's grain shape (granular soils only) gradation, clay/silt content, density, structure, consistency, plasticity, colour, and odour.

These terms and some field identification procedures are outlined below:

(a) Grain Shape - Described by the terms "angular", "subangular" and "rounded". Angular particles have sharp edges and relatively plane sides with unpolished surfaces; subangular particles are similar to angular but have rounded edges; rounded particles have smooth curved sides and no edges.

(b) Gradation - This refers to the particle size distribution of the soil. A "well graded" soil has a good representation of all particle sizes, while a "poorly graded" soil is one in which most particles are similar in size. Particle size distribution can be determined by a sieve analysis and hydrometer. test taken in a laboratory, but a reasonable determination may be made by a simple field dispersion test. To carry out the test, place a small amount of the soil sample in a clear glass jar and mix it well with water. After shaking the jar vigorously, allow it to stand and the soil particles to settle. The sand content will settle in 10 seconds, silt in from 10 seconds to 15 minutes, and fine silt and clay in up to 2 days. In 15 minutes or so, the estimated particle size distribution can be obtained by observing the sample in the jar.

(c) Fine-grained soils such as clay and silt can be identified with simple tests such as dilatancy test, shine test, and dry strength test, as outlined below:

(i) Dilatancy or Shaking Test - This is an important test to distinguish clay soil from silty soils. The test is made by placing a small pat of saturated soil in the open palm of one hand, and tapping the back of the hand against the palm of the other several times. For a silty soil, water will appear quickly on the surface of the pat which changes to a livery appearance and becomes glossy. When the soil sample is squeezed between the fingers, the water and gloss will disappear from the surface. Clay soils do not exhibit this phenomenon.

(ii) Shine Test - If a lump of slightly moist soil is cut with a pen knife, the type of surface resulting is an indication of soil type. A clay soil has a shiny surface; a silty soil has a dull surface.

(iii) Dry Strength Test - If a small piece of dry soil is crushed with the fingers, the breaking strength gives an indication of the amount of clay in the soil. A soil with a very small amount of clay can be powdered easily; a soil with a large amount of clay cannot be broken with the fingers.

(d) Density - Described by the terms "dense", "medium-dense" and "loose". Density can be estimated in the field by the difficulty encountered in boring or digging into the soil strata in question. Another method of estimation is based on the use of a reinforcing rod of about 13 millimetres diameter as follows:

Term	Relative Density	Field Test
Loose	0-50%	Easily penetrated with 13mm reinforcing rod pushed by hand.
Firm	50-70%	Easily penetrated with 13mm reinforcing rod driven with 2 Kg. hammer.
Dense	70-90%	Penetrated a foot with 13mm reinforcing rod driven with 2 Kg hammer.
Very dense	90-100%	Penetrated only a few millimeters with 13mm reinforcing rod driven with 2 Kg hammer.

(e) Structure –Described by adjectives such as "stratfied", “fissured lensed","friable","platy", "massive", "prismatic", "blocky" and "granular" which terms are described section 4(b). By breaking a fresh sample and examining the exposed surface, the structure may be identified.

(f) Consistency - This applies to fine grained soils and is described by the terms "hard", "stiff", "firm" and "soft". "Hard" soils are difficult to indent with the thumb-nail and "stiff" soils are readily indented with the thumb. "Firm" soils can be penetrated with moderate thumb pressure. "Soft" soils are penetrated easily with the thumb. The consistency depends on the moisture which varies with the time of year.

(e) Plasticity - described by the terms "highly plastic", "medium plastic" and "weakly plastic". One of two simple tests can be used to assess the plasticity of soils in the field.

(i) Testing the dry strength of the soil. Highly plastic soils are very hard when dry and cannot be crushed with fingers. On the other hand, weakly plastic soils have low dry strength and can be easily crumbled between thumb and forefinger.

(ii) Manipulating the soil with fingers. If a dry sample, water must be added. If the wet soil is highly plastic, it is very sticky with high cohesive properties. Also, it can form a cast which can be freely handled without breaking.

(g) Colour - colour indicates weathering, may give some indication of soil drainage characteristics, and the approximate location of the high ground water table.

(i) Soils that are poorly drained most of the year would generally. have a drab, dull and grey colour, although, as previously stated, an unsaturated, unoxidized parent material can also be grey in colour.

(ii) Soils would have blotches of reddish, yellowish and brownish oxides of iron(mottled soils) if they are periodically flooded by high ground water table. See also Section 9.

(iii) Organic soils are dark in colour. Those containing organic particles will be darker than a similar soil with none.

(h) Odour - normally indicates an organic soil 'or one containing organic particles.

13 NAMING OF SOILS

For accuracy and consistency in the description of soils, the actual description or classification of the soil on the basis of particle size can be enlarged by the use of adjectives describing density, consistency and colour.

(a) The actual description is determined as follows:

(i) Describe soils as boulders, gravel, sand, silt, or clay. If there is greater than 40% of a second size, use “and” i.e. sand and gravel (major constituent sand).

(ii) If there is a component of between 25% and 40%, use adjective i.e. gravelly sand.

(iii) If there is a component of between 10 and 25%, use "some" - i.e. sand with some gravel.

(iv) If there is a component of between 1 and 10%, use "with trace of" i.e. sand with traces of gravel. It is possible to use different combinations to describe a soil - i.e. sand and gravel with traces of silt.

(b) Examples of the naming of a soil combining, in sequence, an adjective for relative density or consistency and colour with the actual description, would be:

(i) Loose reddish-brown fine sand
(ii) Stiff grey silty clay
(iii) Medium dense yellow-brown mottled sandy silt.

14 EFFECTIVE SIZE AND UNIFORMITY COEFFICIENT

Appendix 6.1.1 shows the particle size in millimetres of particles ranging from coarse gravel to clay. Once the grain size distribution in a soil sample has been determined, it can be plotted on a chart of the type in the appendix and the degree of uniformity of particle size can be determined as follows:

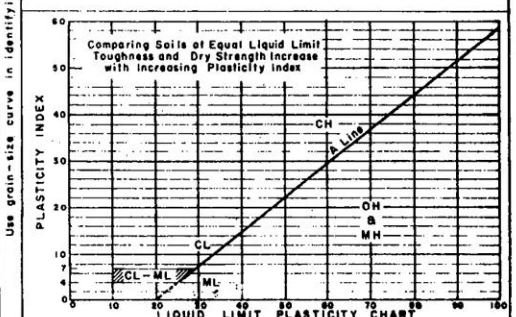
(a) Effective size (D_{10}) - This is the particle size at the point on the chart where the plot of the sample shows 10% of the material is finer and 90% coarser than the particle size. It is expressed as D_{10}.

(b) D_{60} - The particle size at the point on the chart where the plot of the sample shows 60% of the material to be finer and 40% coarser.

(c) Uniformity Coefficient.- obtained by dividing D_{60} by D_{10}. A Uniformity Coefficient of 1 results from a vertical line between D_{60} and D_{10} indicating a soil of very uniform particle size, while a high Uniformity Coefficient indicates a well graded soil.

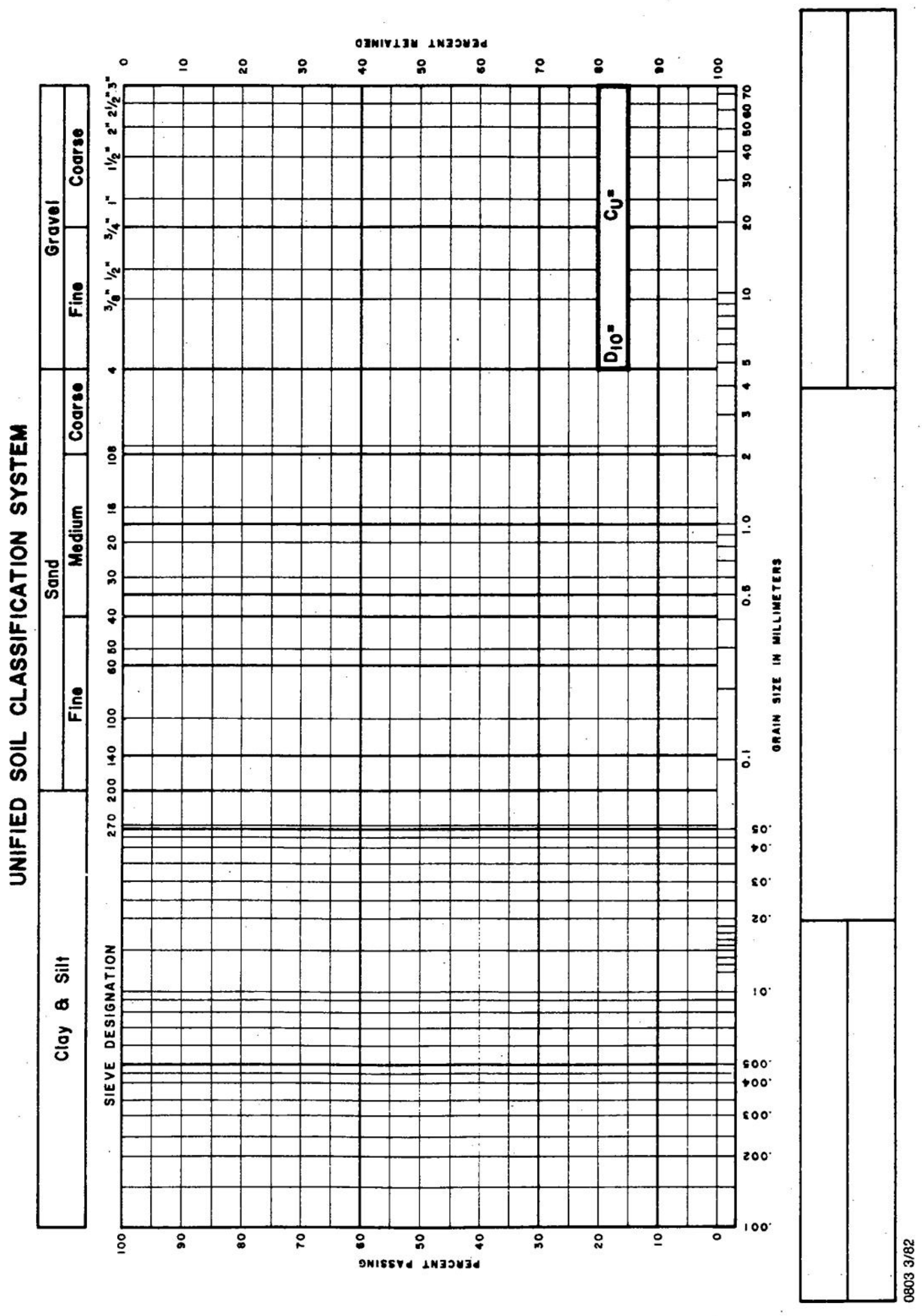
TABLE — I UNIFIED SOIL CLASSIFICATION (INCLUDING IDENTIFICATION AND DESCRIPTION)

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 inches and basing fractions on estimated weights)			INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA	
1	2		3	4	5			6	7	
COARSE-GRAINED SOILS More than half of material is LARGER than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the ¼-in. size may be used as equivalent to the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.	Use grain-size curve in identifying the fractions as given under field identification. Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5%: GW, GP, SW, SP; More than 12%: GM, GC, SM, SC; 5% to 12%: BORDERLINE cases requiring use of dual symbols.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.					Not meeting all gradation requirements for GW
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity. (for identification procedures see ML below)			Give typical name; indicate approximate percentages of sand and gravel, max. size, angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.		Atterberg limits below "A" line or PI less than 4 — Above "A" line with PI between 4 and 7 are BORDERLINE cases requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below)					Atterberg limits above "A" line with PI greater than 7
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size	CLEAN SANDS (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.					$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3
			SP	Poorly-graded sands, gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			Example: SILTY SAND, gravelly; about 20% hard, angular gravel particles ½-in. maximum size; rounded and sub-angular sand grains coarse to fine, about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM)		Not meeting all gradation requirements for SW
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity. (for identification procedures see ML below)					Atterberg limits below "A" line or PI less than 4 — Limits plotting in hatched zone with PI between 4 and 7 are BORDERLINE cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below)					Atterberg limits above "A" line with PI greater than 7
FINE-GRAINED SOILS More than half of material is SMALLER than No. 200 sieve size.					IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE					
					DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PL)			
	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor if any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium			
			OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.		
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium			
			CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High	Example: CLAYEY SILT, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, firm and dry in place, loess, (ML).		
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium			
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.					

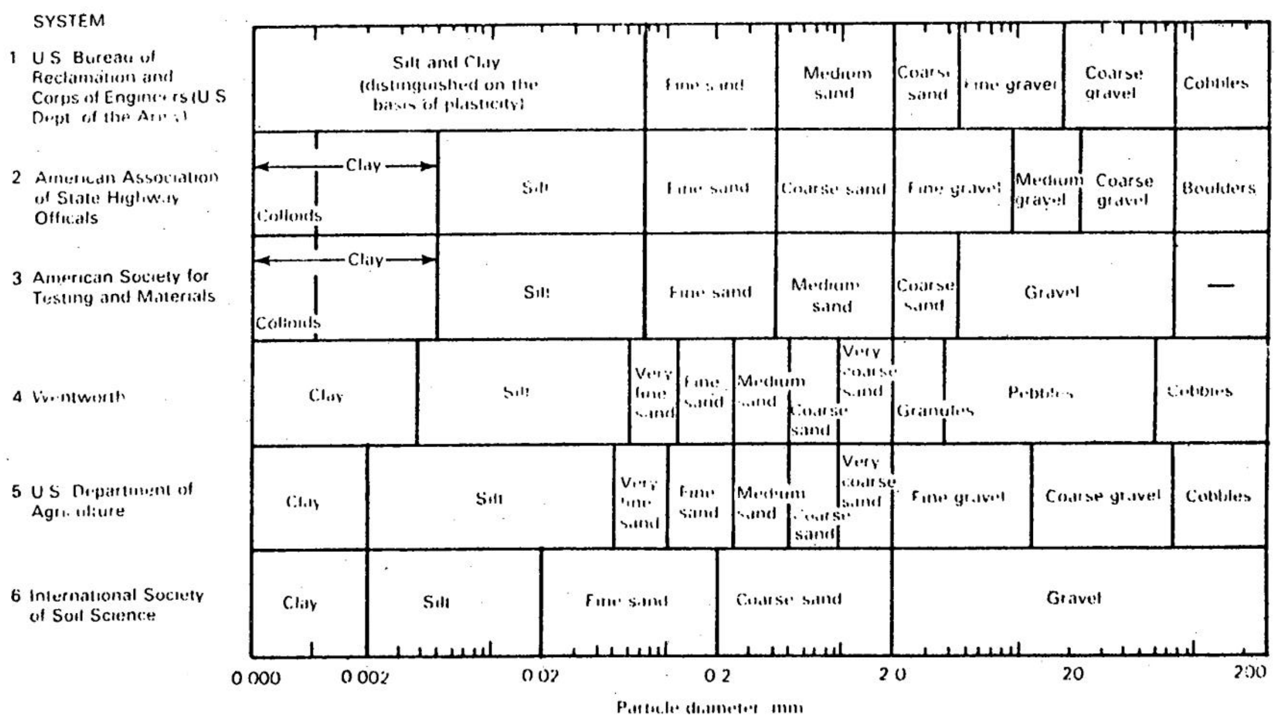


For laboratory classification of fine-grained soils.

(1) Boundary classifications: Soils possessing characterics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder. (2) All sieve sizes on this chart are U.S. standard.


UNIFIED SOIL CLASSIFICATION SYSTEM
Gravel
Coarse
Fine
Sand
Coarse
Medium
Fine
Clay & Silt
SIEVE DESIGNATION
PERCENT RETAINED
PERCENT PASSING
GRAIN SIZE IN MILLIMETERS
C_U=
D_{10}=
0803 3/82

NAMES AND SIZE LIMITS OF PRACTICAL-SIZE
CLASSES ACCORDING TO SIX SYSTEMS (1)



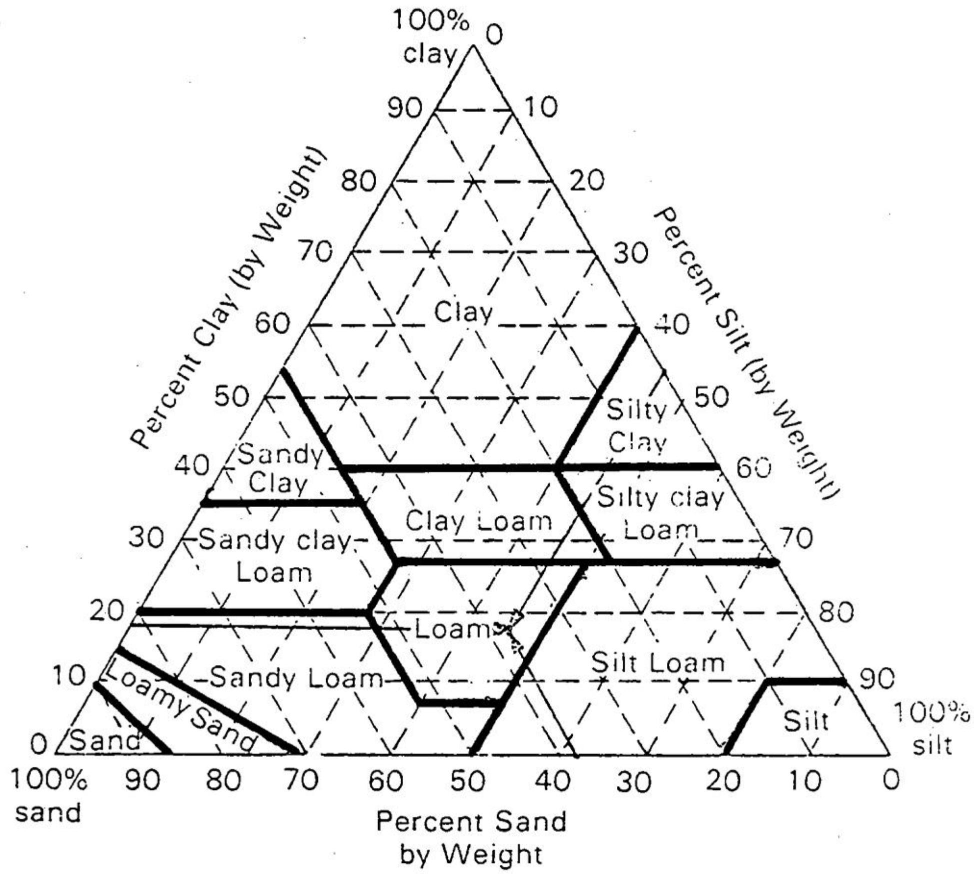
[a] Used in soil engineering

[b] Used in geology

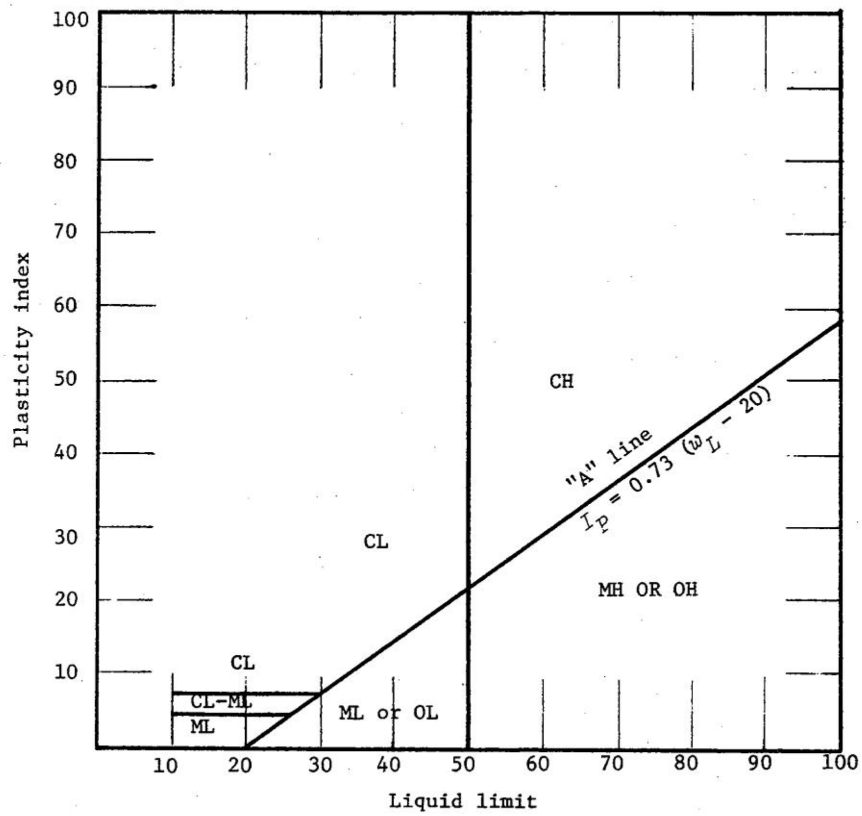
[c] USDA system used in this manual

[d] Used in soil science

TEXTURAL TRIANGLE DEFINING TWELVE TEXTURAL CLASSES OF THE USDA
(ILLUSTRATED FOR A SAMPLE CONTAINING 37% SAND, 45% SILT, AND 18% CLAY)



MODIFIED PLASTICITY CHART FOR USE WITH
THE UNIFIED SOIL CLASSIFICATION SYSTEM



Approximate Relation Between Plasticity Index
And Inherent Swelling Capacity

Plasticity Index	Inherent Swelling Capacity
0-15	Low
10-35	Medium
20-55	High
35-	Very high

(After Seed et al. 1962)

SOIL SYSTEMS CAPACITY TO ABSORB AND TRANSMIT WATER AND SEWAGE

1 ABSORPTIVE QUALITIES AND PERMEABILITY

The capacity of a soil absorption system to receive sewage over an extended period of time involves both the infiltrative and percolative capacity of the soil. Underlying an understanding of these two phenomena are the concepts of porosity - the percentage of the volume that is void space: and perviousness - related to the size of the individual voids. The first of these measures the volumetric capacity of a saturated soil to hold a liquid; the second governs the rate at which the liquid passes through the system. Definitions of infiltrative and percolative capacity, and of permeability, are as follows:

(a) INFILTRATIVE capacity is the rate at which a liquid will pass through the liquid-soil interface. If the liquid is sewage, a clogging layer will develop at this interface and, from a practical viewpoint, the infiltrative capacity will be the capacity of the clogging layer to pass the liquid into the soil.

(b) PERCOLATIVE capacity is the rate at which the liquid moves through the soil once it has passed the liquid-soil interface. It measures the ability of the soil to transmit the liquid.

(c) PERMEABILITY is characteristic of a soil. A liquid will be transmitted more readily through a soil of high permeability than through a soil of lower permeability.

2 SOIL MOISTURE POTENTIAL

(a) Soil permeability is not determined by the soil porosity but, rather, by the size, continuity, and tortuosity of the pores. A clayey soil is more porous than a sandy soil, yet the sandy soil will conduct much more water because it has larger, more continuous pores. Under natural drainage conditions, some pores in the soil are filled with water. The distribution of this water depends upon the characteristics of the pores, while its movement is determined by the relative energy status of the water. Water flows from points of higher energy to points of lower energy. The energy status is referred to as the moisture potential.

(b) The total soil moisture potential has several components. The most important of these are the forces of gravity, capillarity and soil suction or soil moisture tension.

(c) The gravitational component is equal to the weight of the water. The energy this generates at any point is determined by the elevation of that point relative to some reference level. The higher the water level is above this reference (or the "static head") the greater its gravitational potential.

(d) Capillarity is produced by the affinity of water molecules to each other and to solid surfaces. Molecules within the body of water are attracted to other molecules by cohesive forces, while, water molecules in contact with solid surfaces are more strongly attracted to the solid surfaces by adhesive forces. The result of these forces acting together draws water into the pores of the soil. The water tries to wet the solid surfaces of the pores due to adhesive forces, and pulls other molecules with it due to cohesive forces. This phenomenon is referred to as capillary rise. The rise of water is halted when the weight of the water column is equal to the force of capillarity. Therefore, water rises higher and is held tighter in smaller pores than in larger pores. Upon draining, the largest pores empty first because they have the weakest hold on the water. Therefore, in unsaturated soils, the water is held in the finer pores because they are better able to retain the water against the forces of gravity.

(e) Since the water which has been drawn into the soil pores is held against the force of gravity, it has a pressure less than atmospheric. This negative pressure is often referred to as soil suction or soil moisture tension. Increasing suction or tension is associated with soil drying. The moisture content of soils with similar moisture tensions varies with the nature of the pores. When the soil is saturated, all the pores are filled with water and no capillary suction occurs. The soil moisture tension is zero. When drainage occurs, the tensions increase. Because sand has many relatively large pores, it drains abruptly at relatively low tensions, whereas clay releases only a small volume of water over a .wide tension range, because most of it is strongly retained in very fine pores. Silt loam and sandy loams drain more readily than clay, but not as readily as sand.

3 SOIL CLOGGING MECHANISMS - (see footnote at end of this section)

(a) Though physical forces and purely chemical (as opposed to bio-chemical) reactions may lead to alterations in soil pore size and infiltration rate, clogging appears to be predominantly attributable to the accumulation of suspended matter from the wastewater, bacterial cells, and products of microbial activity which collect and eventually block pores. The rates of addition and/or production versus rates of degradation of these clogging materials appear critical. Some clogging occurs under both aerobic and anaerobic conditions but most severe clogging appears when oxygen is absent, or present in only very low concentrations.

(b) Physical factors, which may contribute to soil clogging in some cases, include compaction of soil by heavy loads, smearing of soil surfaces by excavating equipment, and changes in particle distribution, including migration of fine particles by soil vibration during site preparation, and washing down of fines initially perched on larger particles. Many current installation practices neglect these factors with consequent physical damage to soil absorption systems. Chemical factors include aggregate dispersion by sodium ion, iron or phosphate coating of soil particles, and chemical precipitates, such as carbonates or sulfates of certain metals (e.g., Al, Fe, Cd) or alkaline earth materials (ca, Ba, Mg).

(c) It seems apparent that suspended matter, both organic and inorganic, is an important factor in initial decreases in infiltration rate in most systems. Particle size and initial soil pore size are both involved in this aspect of clogging. Large solids are less capable than smaller solids of clogging fine porous media, but more capable of clogging coarse porous media by bridging the large pores through which finer suspended matter easily flows.

(d) The addition of organic matter in the applied wastewater stimulates the growth of microorganisms, particularly bacteria. These microbes may reach high numbers and may behave as particulates, decreasing pore size and interfering with passage of the wastewater. These organisms also consume oxygen and produce breakdown products as they degrade added organic material.

(e) When infiltration rates decrease due to the above factors, and the system is not given sufficient rest for drainage and restoration of soil pore oxygen, oxygen levels in the soil will decrease over time. At decreased oxygen levels, degrading processes proceed at lower rates and, in some cases, apparently cease. This may lead to the accumulation of microbial products, eventually producing severe clogging.

(f) Polysaccharides, particularly, polyuronides, which are constituents of sticky gums and which are degraded only under very aerobic conditions, are the most likely substances responsible for severe and prolonged clogging. These carbohydrates, notable for their role in aggregate stabilization, apparently help bind clay particles together as long as there are surface sites available for such binding, and in this state are resistant to degradation. When surface sites are exhausted, newly produced polysaccharides are rapidly degraded if oxygen is available, but accumulate as part of sticky gums if oxygen tension is low. Polyuronides appear to be particularly resistant to degradation in the soil, probably due to complexities with some other organic material. These substances have been shown to accumulate in soil coincident with decreased infiltration rates.

Total organic matter in soil samples has also shown positive correlation with changes in infiltration rate, and it is likely that other organic substances which tend to resist degradation (e.g., lignins, tannins, waxes) also interfere with infiltration of wastewater throughout the process. Dead microbial cells, decomposed only slowly in anaerobic atmosphere, probably are also a factor. It should be noted that aerobic tanks provide an effluent with higher dissolved oxygen content than septic tank effluents. However, it remains to be determined if the initial aeration of effluent carries very far into the soil interface down the length of a tile field. The solubility of oxygen in fresh water is around 10 mg/l. If the effluent has a BOD (and/or COD) higher than the dissolved oxygen level (aerobic tank effluents usually exceed a BOD of 10 mg/l), anaerobic conditions will set in when the dissolved oxygen is used up unless extra oxygen is supplied by diffusion through the soil.

When the soil atmosphere becomes anaerobic, ferrous sulfide is usually produced spontaneously by the reaction of ferrous and sulfide ions, separately produced by anaerobic microorganisms which use sulfate and ferric ions as electron acceptors in their metabolic processes. The source of the iron and sulfur may be the wastewater, or the soil, or both. The FeS particles are colloidal and could contribute to severe clogging in some cases, but their presence is generally accepted more as an indicator of the anaerobic conditions which lead to clogging rather than a cause in themselves.

Note: This Section extracted from the March 1972 Report by the Mitre Corporation prepared for the Office of Water Programs (U.S. Government) and approved for public release.

4 FLOW OF WATER IN SOIL

(a) The flow of water in a soil depends on the force driving it and the soil's ability to transmit it, which is, in turn, related to the number, size and configuration of the pores. Large water-filled pores transmit water easily whereas small discontinuous water-filled pores offer high resistance to flow. Thus the pore characteristics govern the flow when all pores are water-filled. When the soil dries, the larger pores empty first and fill with air and only the smaller water-filled pores transmit the water. Therefore a soils ability to transmit water decreases as a soil dries but is retained for a longer period in the "drying" cycle of fine grain soils because of their fine pores. Water will not be transmitted through a completely dry soil until some of the pores are saturated. As water is added, the first pores to be filled are the smallest pores, as these exert the greatest suction.

(b) In a saturated soil the downward movement due to the force of gravity is predominant. In unsaturated soil both gravity and capillary forces determine the direction of flow which may be upward, sideways or downward.

(c) Soil layers of varying permeability interface with the movement of water. Water will pond above a lower layer which cannot transmit water as fast as a more permeable upper layer can deliver it. On the other hand, where a fine grained soil lies above a more permeable soil, the underlying layer cannot absorb the water until the

downward forces overcome the soil moisture tension in the small pores of the upper soil. A fine grained upper soil may need to approach saturation before it will release the water.

5 THE INFILTRATIVE CAPACITY OF SOIL AT THE SOIL/SEWAGE INTERFACE

The clogging mat formed at the infiltrative surface in a soil disposal system may restrict movement in the manner described in 4(c) to the point where sewage is ponded above the mat and the soil below is unsaturated. The infiltrative capacity will depend on the hydrostatic pressure of the water ponded above the mat and the soil suction of the unsaturated soil below the mat. It may be primarily due to one of these forces but is often a combination of both. Flow through the mat to the soil:

(a) may be less than the soil can transmit. If the mat becomes very restrictive to flow then only the small pores of the soil below will transmit the liquid passing through the mat.

(b) may be greater than the percolative capacity of the soil in which case it will pond or mound up above the underlying soil.

SOIL PERMEABILITY AND PERCOLATION TIME

1 GENERAL

As had been seen in the previous articles soil is a very varied material. It's ability to absorb and transmit liquids depends not only on its basic characteristics but on other varying factors such as its location, density and the degree of mechanical disturbance to which it has been subjected. It is necessary to adopt a means of classifying soils which can be used in the design of sewage systems. In soil assessment system design it is necessary to determine such matters as:

(a) The permeability of any soil strata which has a bearing on the design.

(b) The sewage loading per unit of surface area that can be applied to the soil.

(c) The overall hydraulic capacity of the site to absorb the sewage loading without breakout to the surface or ground water impairment.

2 COEFFICIENT OF PERMEABILITY AND PERCOLATION TIME

(a) The two factors commonly used to rate a soil for purposes of its use in a sewage disposal system are:

(i) The Coefficient of Permeability. - Written as 'k' and expressed in centimetres per second (cm/sec) or metres per day is a measure of the ease with which a liquid will pass through a soil. Its use in this Manual refers to soils in their saturated state with water as the liquid.

(ii) Percolation time - Written as "T" and expressed in minutes per centimetre (min/cm) and defined as the average time in minutes that is required for water to drop one centimetre during a soil percolation test, as determined by the test or by other means.

(b) It can be seen that a soil through which water passes readily will have a high value of "k" and a low value of "T". The reverse applies to a soil highly resistant to transmitting water. Although "T" relates to water as the liquid, the tables and formulae in which "1" is used are designed to account for the fact that the liquid is sewage.

(c) The value of "T" for use in small sewage system design is usually determined in the field as a result of visual observations, simple field tests and experience. One such test is the standard percolation test. The Coefficient of Permeability is determined bylaboratory tests conducted on samples.obtained in the field. More details of all laboratory tests are contained in Article 6.4.

3 SOIL CHARACTERISTICS AFFECTING PERCOLATION TIME

Article 6.1 describes the soil characteristics of texture, structure, colour, stratification, density and clay mineralogy. It also outlines field identification procedures. The influence of these characteristics on percolation-time is reviewed hereunder:

(a) Particle size - The finer the particle size the higher value of "T".

(b) Particle size distribution - In a well graded soil the pore spaces become filled with the smaller particles leading to reduced permeability and high values of T.

(c) Soil structure

(i) Soils with platy structure deposited in water tend to have their flatter sides parallel to the surface. The -result is that, in a water lain soil, the horizontal permeability will be greater than the vertical.

(ii) Lake deposits cover wide areas and do not vary greatly in a horizontal direction. There is normally an annual deposition cycle. The beds may be quite thin and vary in composition from season to season, resulting in a rapid change in composition in a vertical direction. The presence of sand seams in a

thick clay layer would increase the permeability and decrease the value of “T" because water can move more easily in the lateral direction. However, the sand seams would have little influence on the soil permeability across the layers, because the flow of water normal to the soil layers is not governed by the more permeable sand seams.

(iii) Stream deposits are generally lenticular and show considerable variation in a horizontal as well as a vertical direction.

(iv) Glacial Till - A heterogeneous glacial deposit of material originating by the mechancial abrasion of the land surface by the ice mass. It may contain all particle sizes from boulders to clay. The permeability of a till will depend on its composition. Tills that are well graded and contain an appreciable proportion of fines, particularly of clay, have low permeability and high values of "T".

(v) Soil in situ may contain visible pores such as root channels, worm holes, animal burrows, cracks, etc., which may increase the permeability of a fine grained soil that is otherwise marginal or unacceptable. Smaller values of "T" are obtained where the visible pores are larger in size, or greater in number, or where they extend continually throughout the soil mass. They will affect the value of T obtained in field tests to a varying degree depending on their prevalence in the volume of soil which is tested. In a laboratory test their influence on reducing T will not be apparent as the soil sample will likely be disturbed.

(vi) Soils having some grains cemented would have larger "T" time.

(vii) Stability of structure for fine-grained soils would be a useful clue for estimating “T” time. If a soil slakes easily with a few drops of water, it would indicate that the fine soil particles can easily clog the soil pores with seepage water.

(d) Density - As a general rule, the greater the density of soils, the greater the "T" time and the lower the coefficient of permeability. The soil density may be estimated by the degree of difficulty in excavating test pits, preparing holes for percolation tests, or obtaining a sample.

(e) Degree of saturation - Normally, permeability decreases with an increase in the soil moisture tension. A drier soil will be less permeable and have a higher soil water tension. The coefficient of permeability used in assessment is that of the soil in its saturated state. The value of T is also determined with the soil in a saturated state.

(f) Type of minerals - For the fine-grained soils, the types of clay minerals have significant effect on the "T" time and permeability. Some minerals swell when water is added and their existence in the soil mass would greatly reduce the permeability and increase the percolation time.

4 PERCOLATION TEST

Section 5 discusses the assessment of "T" for use in design. The field percolation test is one of the methods which can be used.

(a) A percolation test shall be conducted as follows:

(i) Make an excavation in the soil layer which is to be assessed for percolation time. It should have the following dimensions:

- be between 100 and 300 millimetres in diameter.

- be at least 200 millimetres in depth below the upper level of the soil layer being assessed.

(ii) Remove all loose material and smeared clay from the sides and the bottom of the excavation.

(iii) Cover the bottom of the excavation with 50 millimetres of sand or fine gravel.

(iv) Fill the hole with water to a depth of 300 mm (or to surface) and determine the time it takes for the water to seep away; repeat, and if the second filling seeps away in 10 minutes or less, proceed as follows:

- Establish a fixed reference point, add water to a depth of 150 mm above the sand or fine gravel, and measure the water drop every ten minutes for one hour. If for one hour the first 150 mm seeps away in ten minutes or less use a shorter time interval between readings.

- Refill to the 150 mm level when necessary and start another series of readings. Continue readings until the last two series of readings show a similar drop pattern (approximately equal drop in the same number of readings) or, alternatively, until the difference in the maximum and minimum drops in 3 consecutive readings is less than 5 mm. In either case use the average drop of the last 3 readings in computing "T" (see vi below).

(v) If the initial fillings to 300 m take more than 10 minutes to seep away, follow with this procedure:

- Maintain at least 300 mm of water in the hole for at least 4 hours, or until the soil being tested has become swollen and saturated with water. At least 12 hours should be allowed for swelling in clayey soils, although dry clayey soils may require longer periods to obtain a stabilized percolation rate.

- After swelling remove any loose material from the top of the sand or fine gravel.

- Using a fixed reference point, adjust the water level to 150 mm above the sand or gravel and measure the water drop every 30 minutes for four hours or until a stable rate of drop is reached. If the first 150 mm seeps away in less than 30 minutes, use a 10 minute interval and run the test for one hour or until the drop rate is stabilized. A drop of 5 mm or less in a 30 minute interval is indicative of a soil of "T" close to or greater than 50 min/cm. If it is to be assessed, increase the reading interval to 60 minutes.

- Refill with water to the 150 mm level when necessary. Take readings until a stable rate of drop is reached. This may be when the drop in 2 successive readings does not vary by more than 1.5 m or when the difference between the maximum and minimum readings of the last 4 successive readings does not exceed 5 mm. Once a stable rate is reached use the average drop of the last 3 readings in computing the percolation time (see vi below).

(vi) $$\text{Percolation Time (mins/cm)} = \frac{\text{Time interval (minutes)}}{\text{Average drop of last 3 readings(cm)}}$$

(b) If the percolation time determined in (vi), is less than two minutes, a percolation time of two minutes per centimetre shall be assumed for design purposes. To improve accuracy the test may be repeated and the average of the percolation times from each test used as the design percolation time. Prior to each additional test, clear water shall be added to restore the liquid depth to 150 millimetres.

(c) A percolation test may be taken for a variety of reasons as follows:

(i) To determine the acceptability of a site for the location of a leaching bed.

(ii) To determine the value of “T” to be used in computing distribution pipe requirements for an absorption trench type of leaching bed. In such cases the depth of excavation should be to the level of the bottom of the proposed absorption trenches, or such greater depth as will ensure that the test excavation penetrates at least 200 millimetres into the soil strata of the type that will underly the absorption trenches.

(iii) To determine the value of “T” of the uppermost natural soil layers. This is to assess their suitability for use as a soil mantle through which lateral movement can take place, and for comparison with the “T” value of a soil proposed for use as fill.

5 PERCOLATION TIME "T" TO BE USED IN DESIGN

(a) The percolation test as described in Section 4 is one method of determining the percolation time of a soil. It must be carefully conducted. Desirably, several tests should be taken to cover the area to be occupied by the leaching bed. The test holes must be carefully prepared to avoid smearing of clay surfaces and the soil must be well saturated before the measurements are taken. As a result it is a time consuming method of determining percolation time. This could be accepted if the results could be relied upon. Unfortunately, the many variables bearing on the results can cause wide disparities between readings at the same site. Thus, in assessing a site for a small sewage system, it is normal to estimate the field percolation time based on soil factors and the conditions found at the site. An inspector's experience and knowledge of the soil conditions in the immediate vicinity, and of the success or failure of systems constructed in these or similar soils, will assist in arriving at a reasonable estimate of the percolation time.

(b) Laboratory testing, reviewed in Article 6.4, is time consuming. It also has the disadvantage of being conducted on a sample which cannot be completely representative of the soil in its natural state, even if an undisturbed sample is obtained. Attempts have been made to correlate permeability factors determined in the laboratory to percolation times measured in the field. An approximate correlation between the percolation time, the coefficient of permeability and grain size distribution may be made for soils which are mostly granular. A consistent correlation for fine grained soils has not been found, although a comparison of these factors does provide an indication of whether or not the soil is in the acceptable range for sewage disposal, or will be a "problem" soil. If considered in conjunction with other field observations, such as structure, consistency, density, colour, odour, and with other tests, such as for plasticity, a reasonable correlation can be made. Combined with experience of similar soils, consideration of all these factors is the best that can be done in selecting values of "T" for the design of small sewage systems.

(c) Value of "T" for distribution pipe requirements - The design of leaching beds is covered in Chapter 8. To compute distribution pipe requirements an assessment of the soils in which the absorption trenches are located, and to a depth of 0.9 metres below the trenches, is required. If this is all one soil strata, only one judgement need be made. If it contains more than one strata, the effect of each must be considered. In-ground beds in stratified soils are one example. Raised beds, with the trenches located in imported fill placed above retained acceptable soils, are another. A value of "T" for design may be selected that is higher than that of the soil in which the trenches are actually located. The relative thickness of each layer, the value of "T" for each layer, and the difference in "T" values of adjoining layers, should be considered. As the liquid percolates downward, its quality will improve. Also, its loading will be spread over a widening area as the depth below the trench bottom increases. Thus, as a guide:

(i) The greater the similarity in "T" value of one layer to that of the next lower layer, the more reason to accept the "T"of the soil in which the trench is located.

(ii) The more dissimilar the "T" values, the more important it is that the layer in which the trench is located has appreciable depth below the trench. If this is a small proportion of the 0.9 metres, select the "T" of the first layer of significant proportion. If the soil in which the trench is located has a depth of at least 0.3 metres below the trench, its "T" value could be used.

(d) Value of "T" of upper soil mantle - This must be determined when site conditions require a leaching bed to be raised. Of concern is the value for the upper 0.25 metres of soil which lies under the vegetation cover and organic top soil. It will indicate if the soil is acceptable under the regulation for use as a mantle, or whether suitable soil for this purpose must be imported. If suitable, it will provide the value of "T" for computing the contact area to be covered by the filter medium in a filter type leaching bed. It will also permit comparison with the percolation time of any fill material proposed for use in a raised absorption trench bed.

(e) Value of "T" of imported fill - This is required for design purposes. For workability at the site, imported soils should be primarily granular in texture. The upper value of "T" should not be greater than 12-15 mm/cm. Fills of very low "T" value less than 1 are not acceptable. Imported fills should not have a "T" value less than 2 mm/cm and this should be the lowest value used for design computations.

(f) Value of "T" for overall site acceptability - The values determined in (c) to (e) will suffice for most sewage systems. If an assessment is required of the capacity of a subdivision, or large commercial enterprise, to continually absorb and transmit sewage without breakout to the surface or impairment of the ground water, a study of the ground water movement is required. In such a study the coefficient of permeability, rather than the percolation time, will be the factor used in computations. This is further covered in Appendix 8.4.2.

6 ESTIMATION OF PERCOLATION TIME

(a) The purpose of this Section and the associated appendices is to provide assistance to those who must decide on the percolation time(s) to be used in design. Suggested relationships between percolation time, coefficient of permeability and soils of various types are given. IT MUST BE EMPHASIZED THAT, PARTICULARLY FOR FINE GRAINED SOILS, THERE IS NO CONSISTENT RELATIONSHIP DUE TO THE MANY FACTORS INVOLVED. The following guidance is presented for the soil types outlined in the Unified Soil Classification System (App. 6.1.1). In order to assess a particular soil.

(i) Appendix 6.3.1 - Approximate relationship of soil types to permeability and percolation time.

(ii) Appendix 6.3.2 - Typical grain size distribution curves for soil types in the Unified Soil Classification System.

(b) In Appendix 6.3.1 a range of values of "k" and of "T" are given for various soil descriptions. The principal modifiers which will influence selection of a “T” value within the range given are:

(i) The structure - "massive" fine-grained soils have high values of "T".

(ii) The density - For a given soil higher density produces a higher value of "T".

(iii) The percentage of clay - the higher the percentage the higher the value of "T".

(iv) The mineralogy of the clay portion - The more it "swells" the higher the value of "T".

(v) The plasticity of the soil - The higher the plasticity index the higher the value of "T".

(vi) Liquid Limit - The higher the liquid limit the higher the value of "T".

(vii) Organic content - The presence of fine organic particles, detectable by colouration and odour, can significantly reduce the permeability and raise the value of "T".

APPROXIMATE RELATIONSHIP OF SOIL TYPES TO PERMEABILITY AND PERCOLATION TIME

SOIL TYPE (unified soil classification)	Coefficient of Permeability K - cm/sec.	Percolation Time - T mins/cm.	Comment
COARSE GRAINED - MORE THAN 50% <u>LARGER THAN #200</u>			
G.W. - Well graded gravels, gravels-sand mixtures, little or fines.	10^{-1}	< 1	Very permeable unacceptable
G.P. - Poorly graded gravels, gravel-sand mixtures, little or no fines.	10^{-1}	<1	Very permeable unacceptable
G.M. - Silty gravels, gravel sand-silt mixtures.	$10^{-2} – 10^{-4}$	4 - 12	Permeable to Medium perme-able depend-ing on amount of silt.
G.C. - Clayey gravels, gravel-sand-clay mixtures	10^{-4} -10^{-6}	12 - 50	Important to est. amount of silt and clay.
S.W. - Well graded sands, Gravelly stands little or no fines	$10^{-1} – 10^{-4}$	2 - 12	medium perme-ability
S.P. - Poorly graded sands gravelly sand, little or no fines	$10^{-1} – 10^{-3}$	2 - 8	medium perme-. ability
S.M. - Silty sands, sand-silt mixtures	10^{-3} -10^{-5}	8 - 20	medium to low permeability
S.C. - Clayey sands, sand-clay mixtures	$10^{-4} – 10^{-6}$	12 - 50	medium to low permeability (depends on amount of clay)

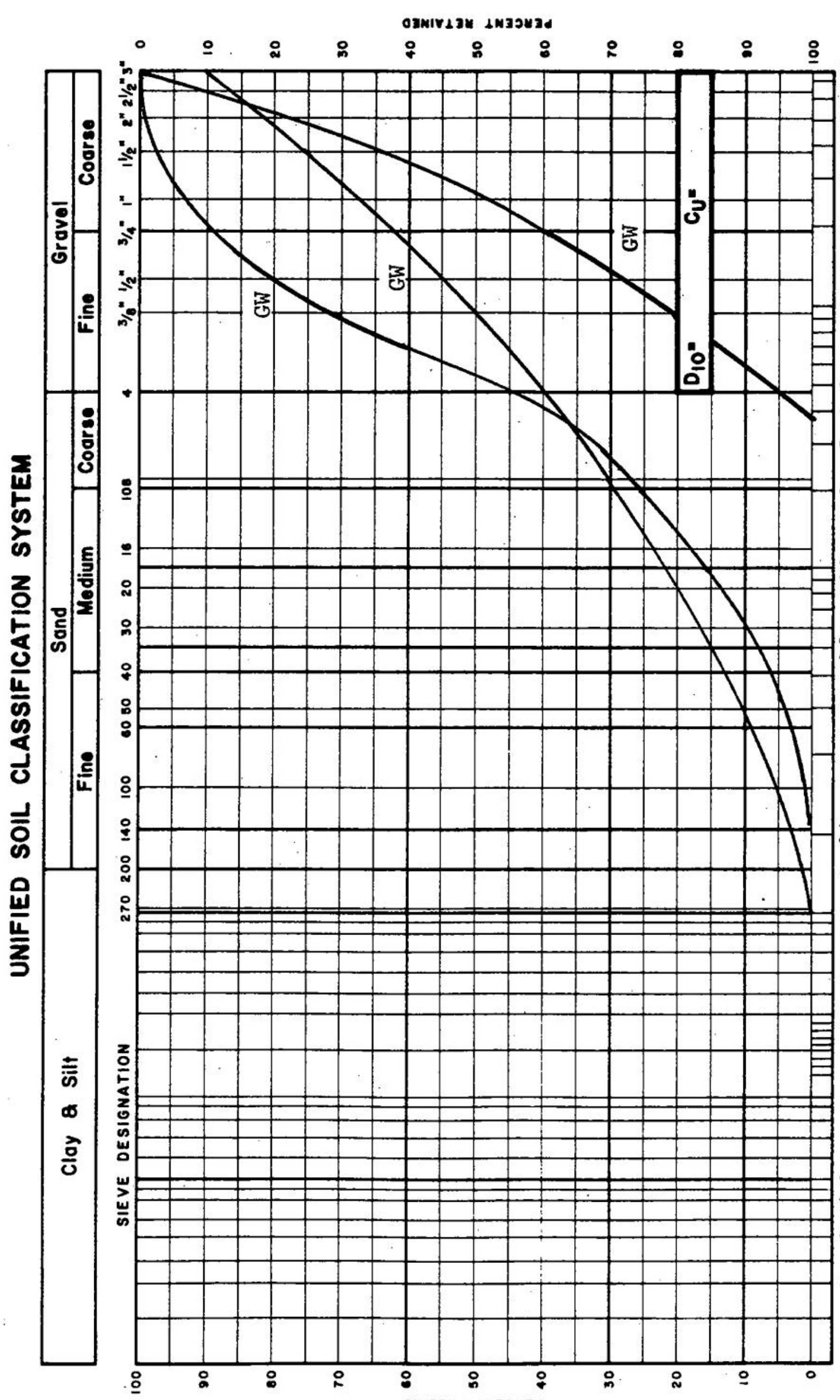
SOIL TYPE (unified soil classification)	Coefficient of Permeability K - cm/sec.	Percolation Time - T mins/cm.	Comment
FINE-GRAINED - MORE THAN 50% <u>LARGER THAN #200</u>			
M.L. - Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, clayey silts with slight plasticity.	10^{-1}- 10^{-6}	20-50	medium to low permeability
C.L. - Inorganic clays of low . to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	10^{-6} and less	over 50	unacceptable
O.L. - Organic silts, organic silty clays of low plasticity; liquid limit less than 50	10^{-5} and less	20 – over 50	Acceptable depends on clay content.
M.H. – Inorganic silts, mi-Careaous or diatomageous fine Sandy or silty soil, elastic Silts	10^{-6} and less	over 50	unacceptable
C.H. – Inorganic clays of Medium to high plasticity, organic silts.	10^{-7} and less	over 50	unacceptable
O.H. – Organic clays of Medium to high plasticity-Organic silt; liquid limit Over 50	10^{-6} and less	over 50	unacceptable

<u>SELECTION OF "T" TIME FROM THE ABOVE TABULATION</u>

A range of "T" times for each soil type is shown above. Select from within this range by determining if the soil is within the low, middle or high part of the range considering the soil identifiers (Article 6.1) and soil characteristics in section 3 of this Article. Consider structure, density, colour, prevalence or organics, the clay content and minerology, the plasticity index and liquid limit (subsection 6.3.6(b)) and the functioning of existing systems in similar soils in the area.

Note: The following Ministry of the Environment Reports provide further information on the relationship between grain size, coefficient of permeability and percolative time.

- "Study on the Feasibility of Correlating Percolation Time with Laboratory Permeability" - 1975 - Research Report No. S57 by H. T. Chan, PhD., P.Eng.
- "Study of Conventional Tile Fields in Fine-Grained Soils" -1979 Research Report 74 by H. T. Chan, PhD., P.Eng.



GW - Well-graded gravels, gravel-sand mixtures
- Less than 5% finer than 0.074 mm
- Uniformity coefficient > 4

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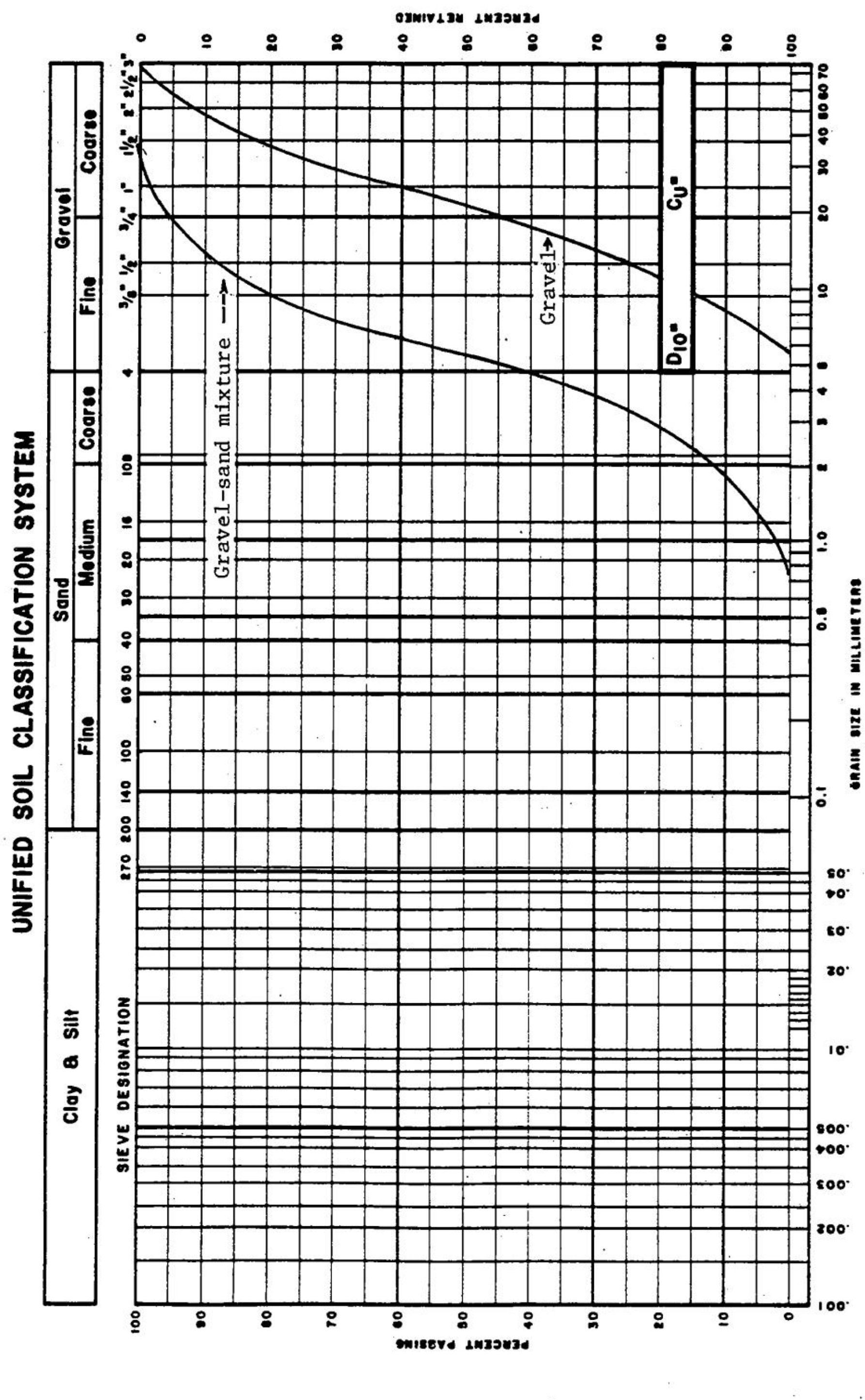
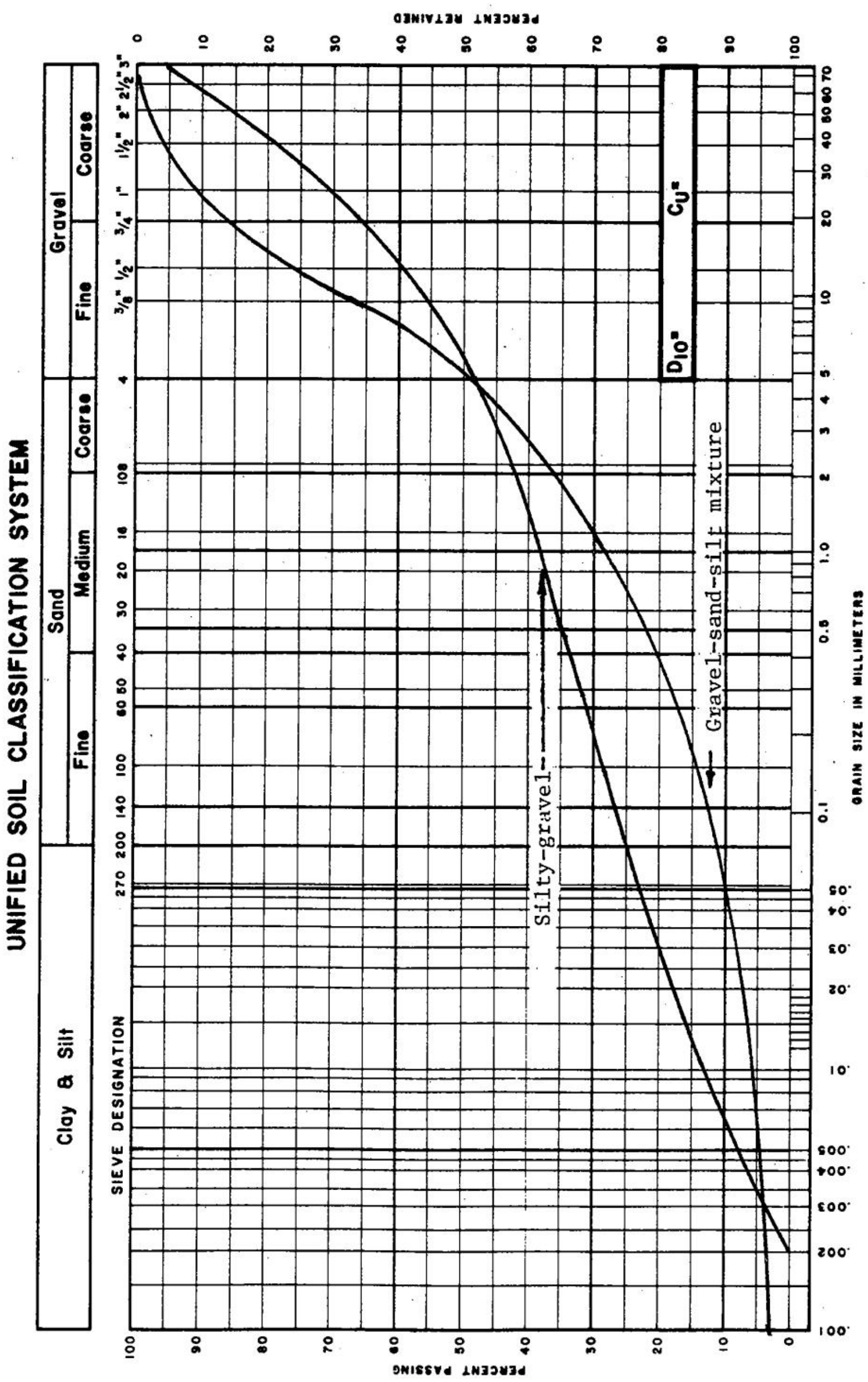


GP - Poorly-graded gravel, gravel-sand mixtures
- Less than 5% finer than 0.074 mm
- Uniformity coefficient less than 4



GM - Silty-gravels, gravel-sand-silt mixtures
- More than 12% finer than 0.074 mm
- Non-plastic - plasticity index less than 4
- Plots below "A" line on plasticity chart

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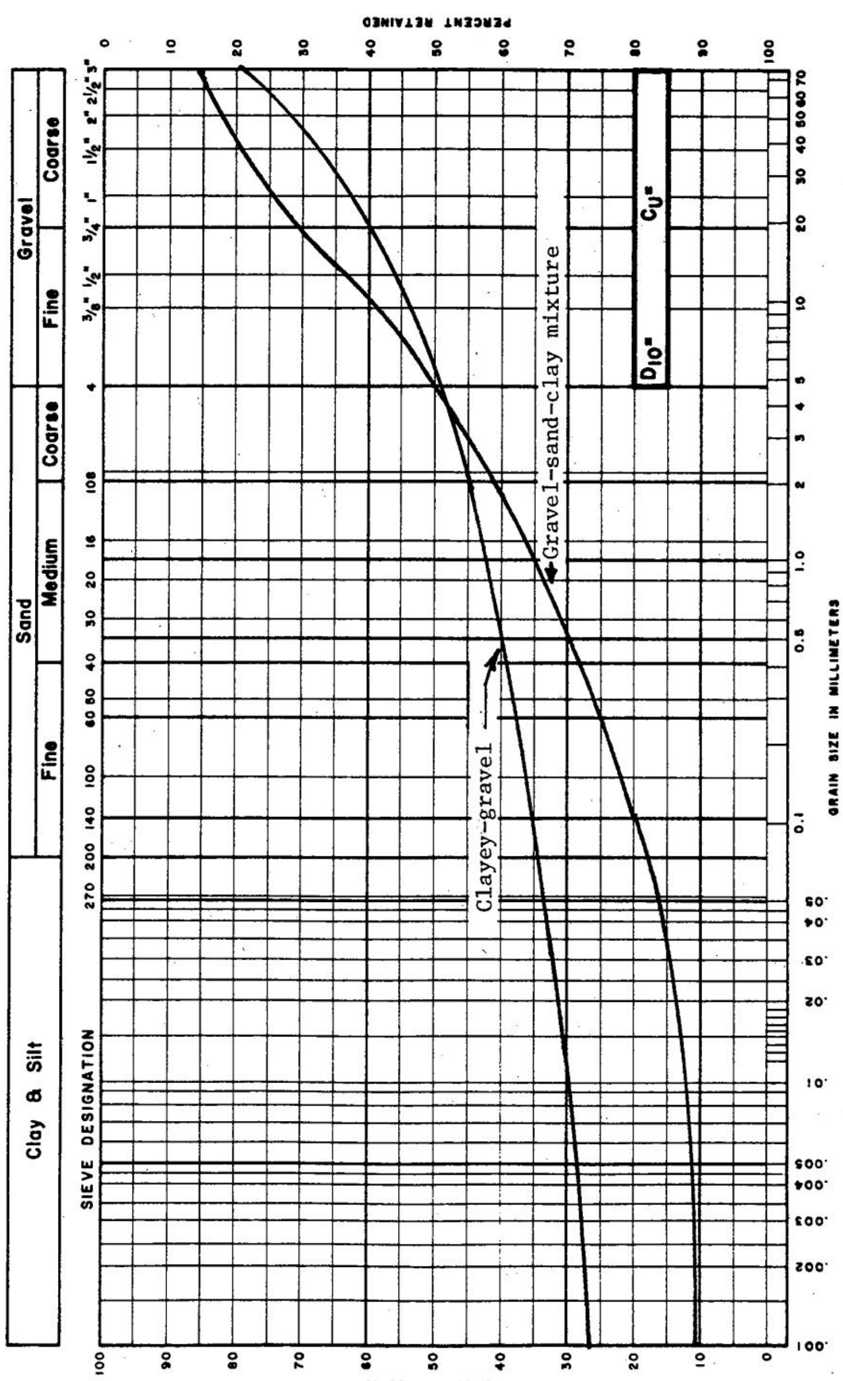
UNIFIED SOIL CLASSIFICATION SYSTEM



GC - Clayey-gravels, gravel-sand-clay mixtures
- More than 12% finer than 0.074 mm
- Plasticity index greater than 7
- Plots above "A" line on plasticity charts

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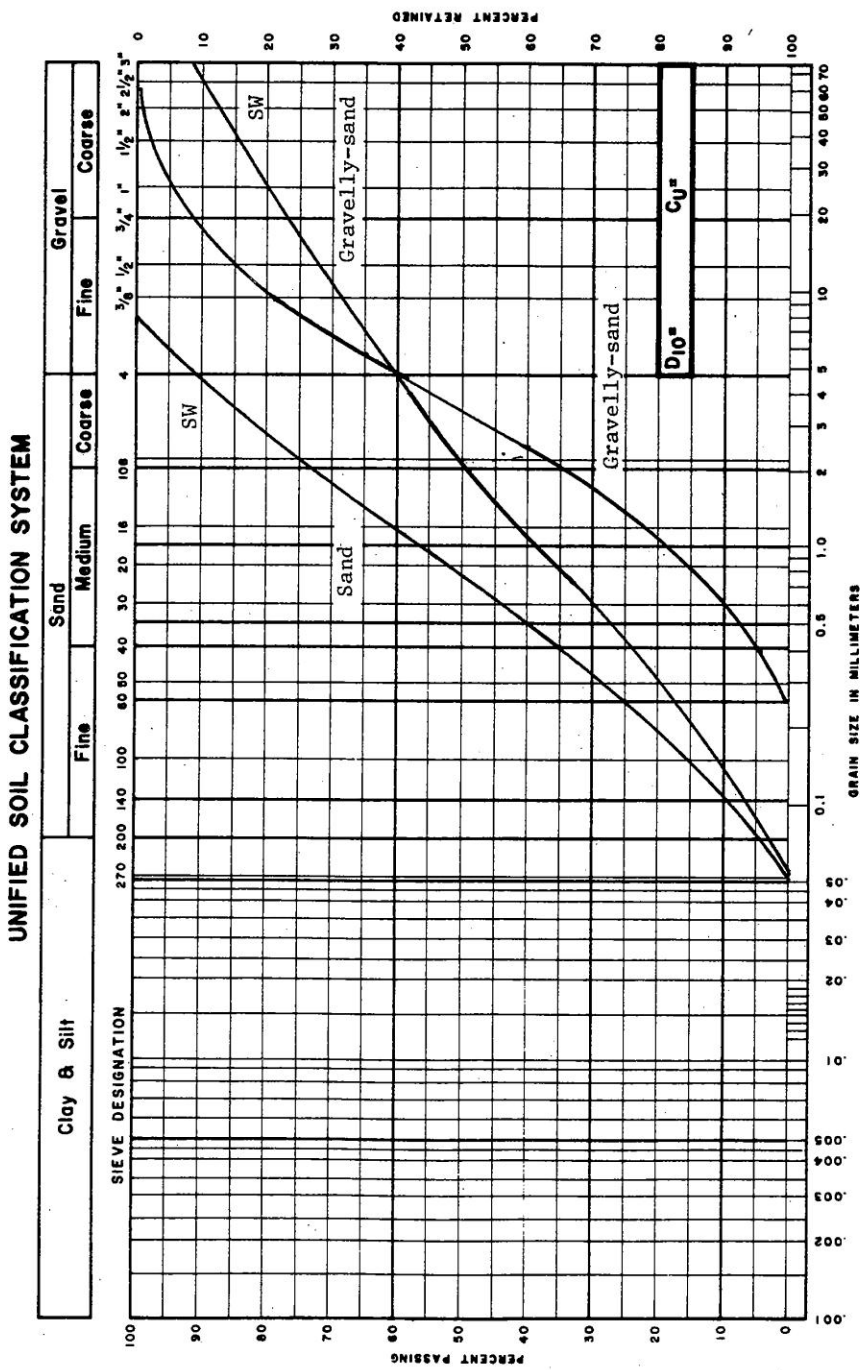

SW - Well-graded sands, gravelly-sands
Little or no fines (< 5% passing 0.074 mm)
Uniformity coefficient > 4

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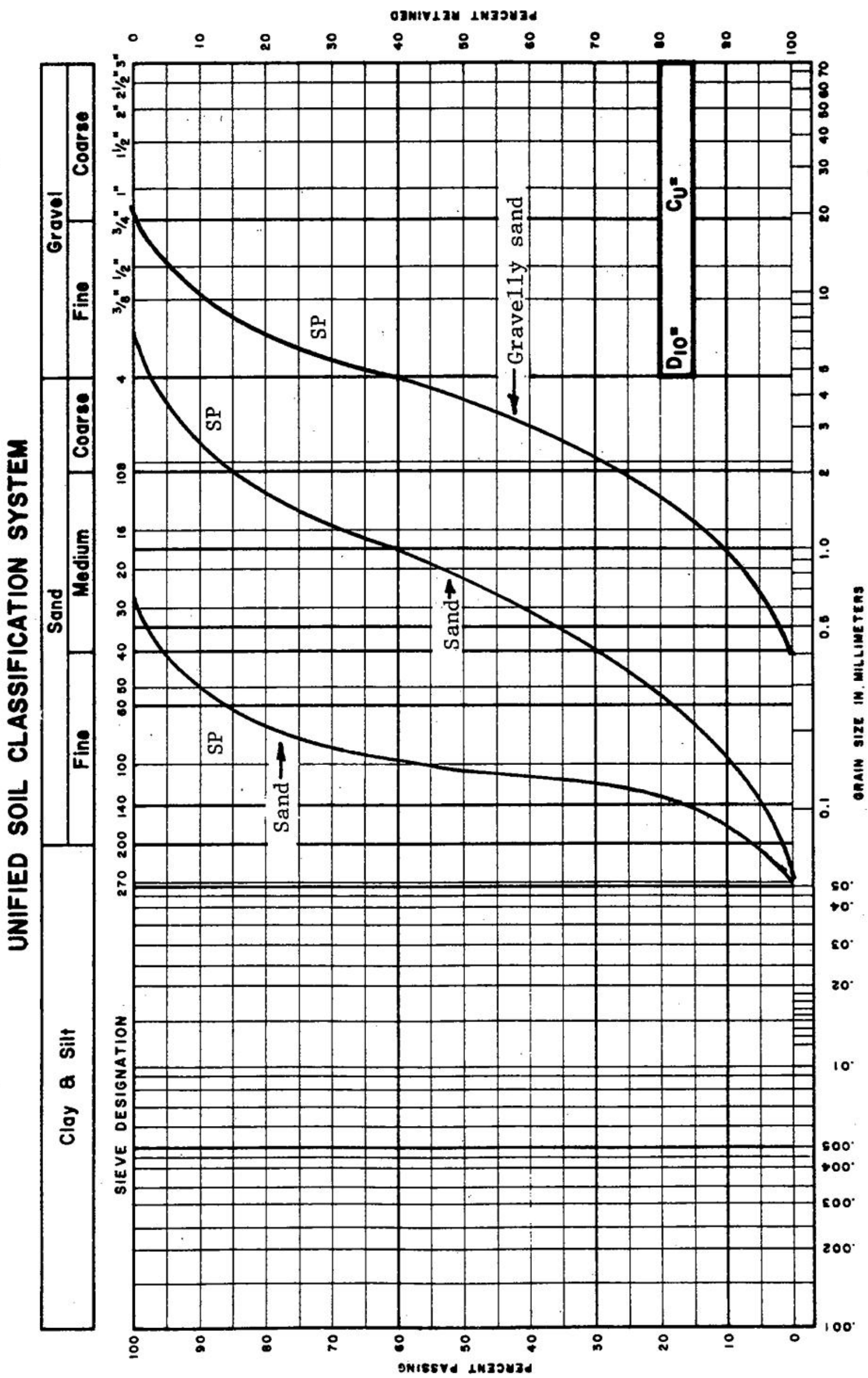

SP - Poorly-graded sands & gravelly-sands
- Little or no fines (< 5% passing 0.074 mm)
- Uniformity coefficient < 6

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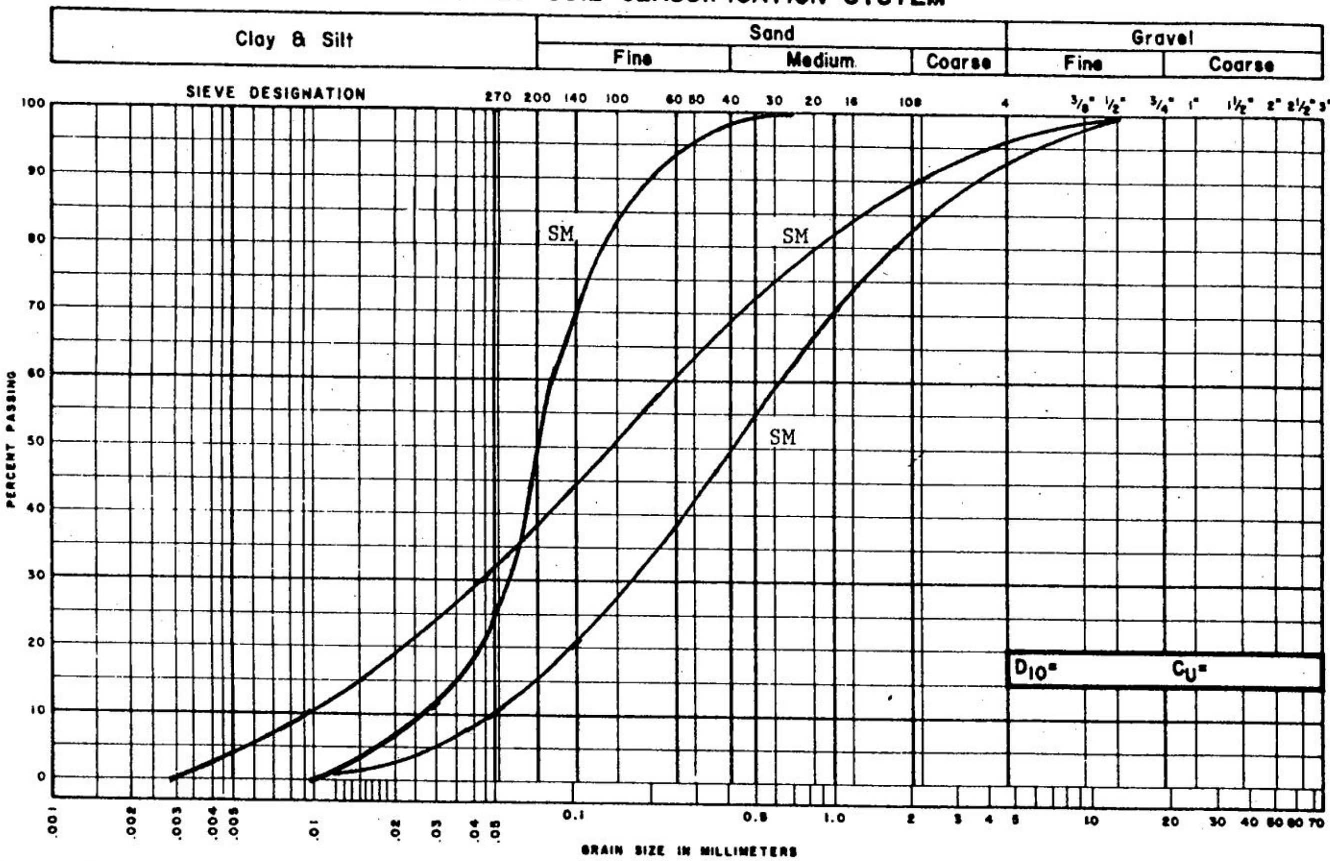
UNIFIED SOIL CLASSIFICATION SYSTEM



SM - Silty sands, sand-silt mixtures
- More than 12% finer than 0.074 mm
- Plasticity Index (I_p) less than 4
- Plots below "A" line on plasticity chart

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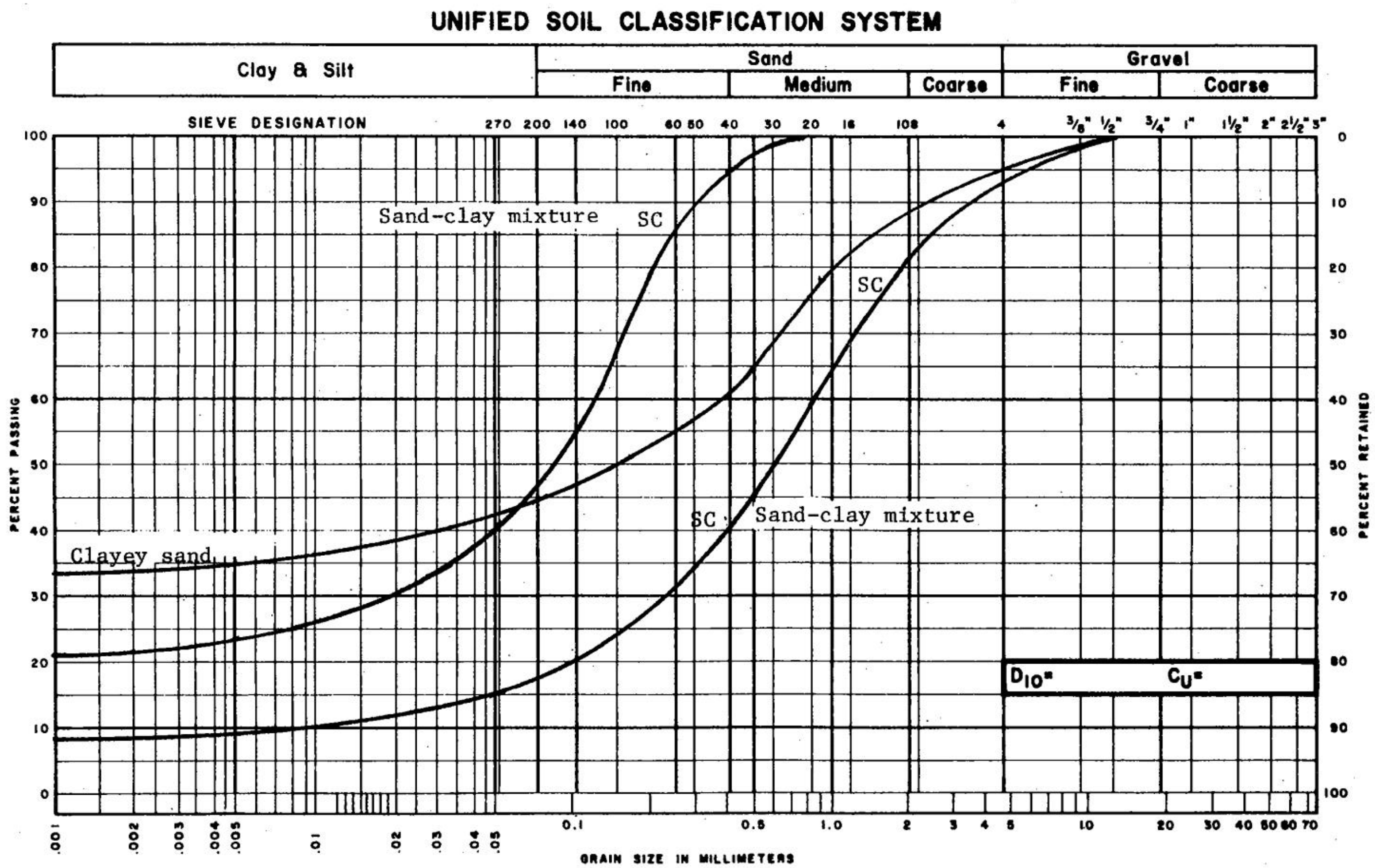

SC - Clayey sands, sand-clay mixtures
- More than 12% finer than 0.074 mm
- Plasticity index greater than 7
- Plots above "A" line on plasticity chart

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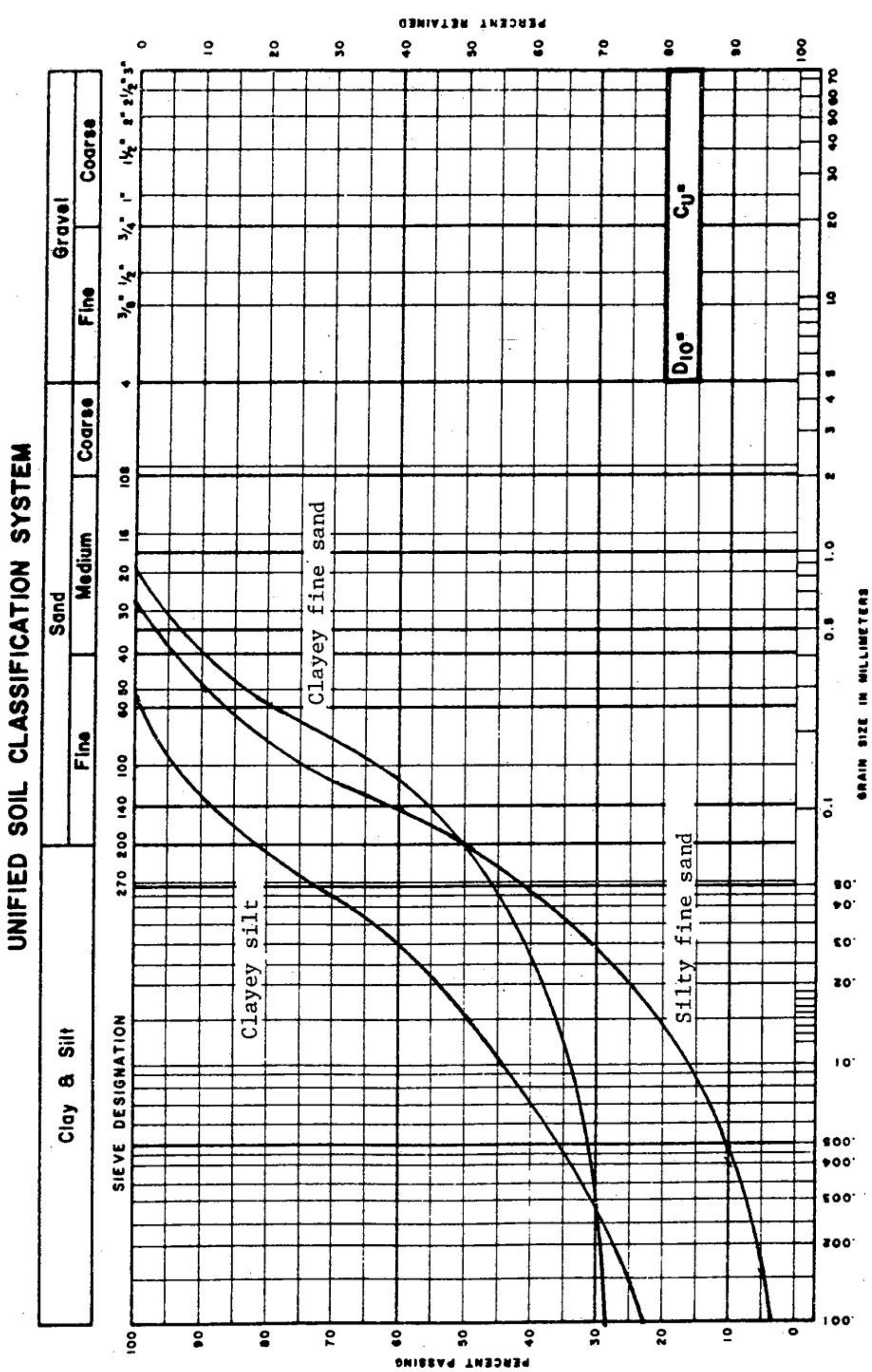

ML - Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity
W_L less than 50

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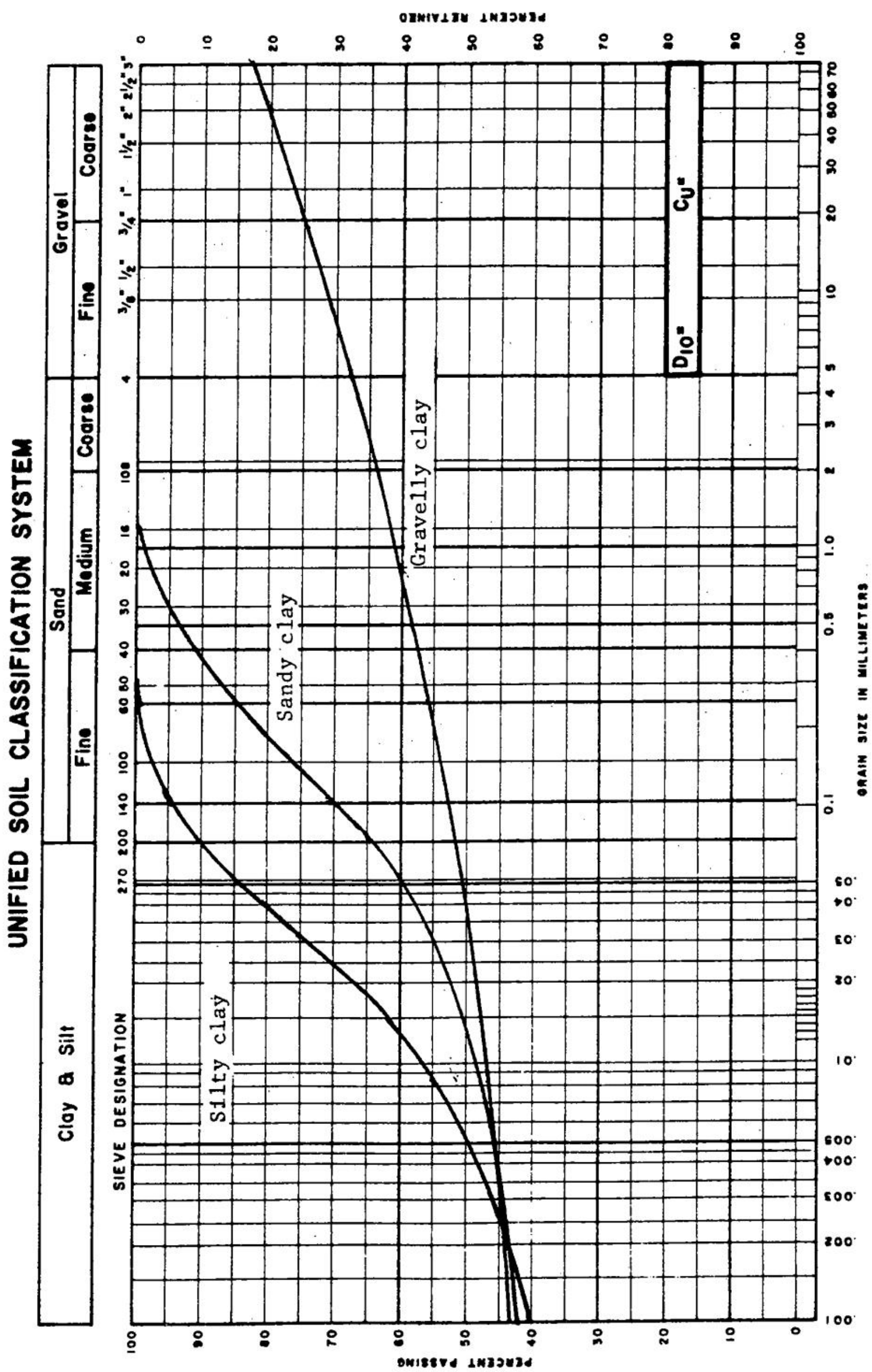

CL - Inorganic clays of low to medium
plasticity, gravelly clays, sandy clays
silty clays, lean clays
w_L less than 50

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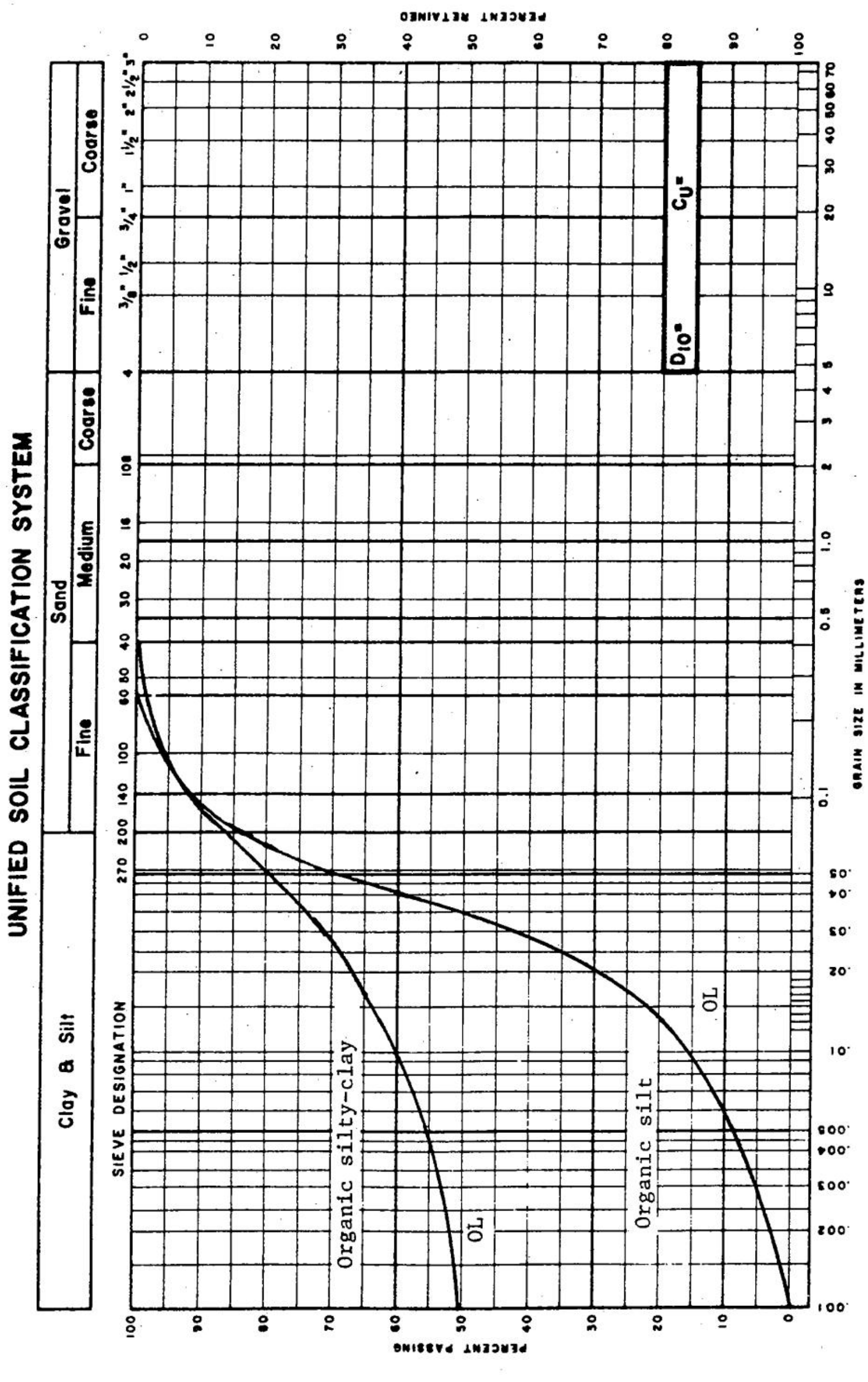

OL - Organic silts, organic silty-clays of
low plasticity
Liquid limit (w_L) less than 50

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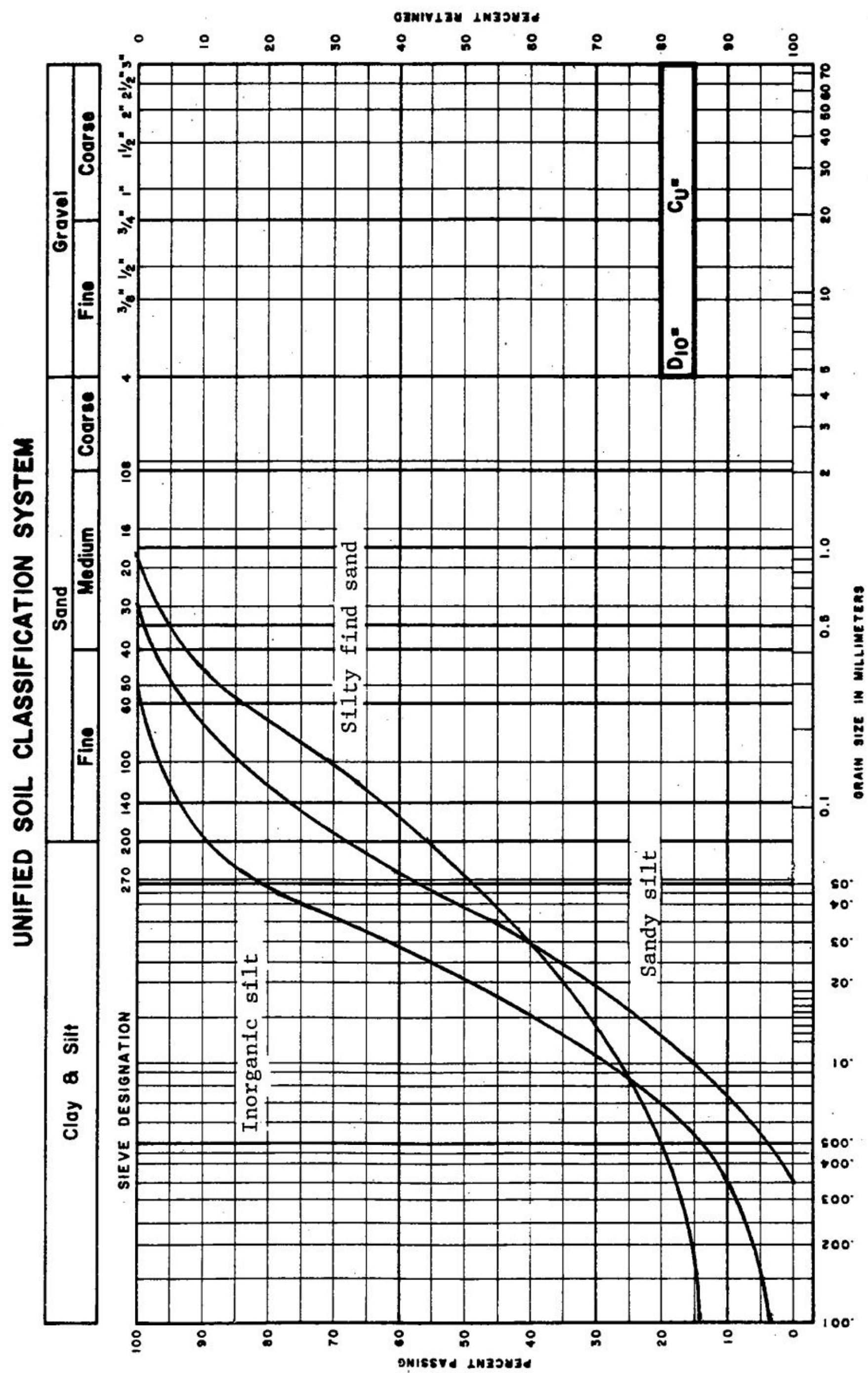
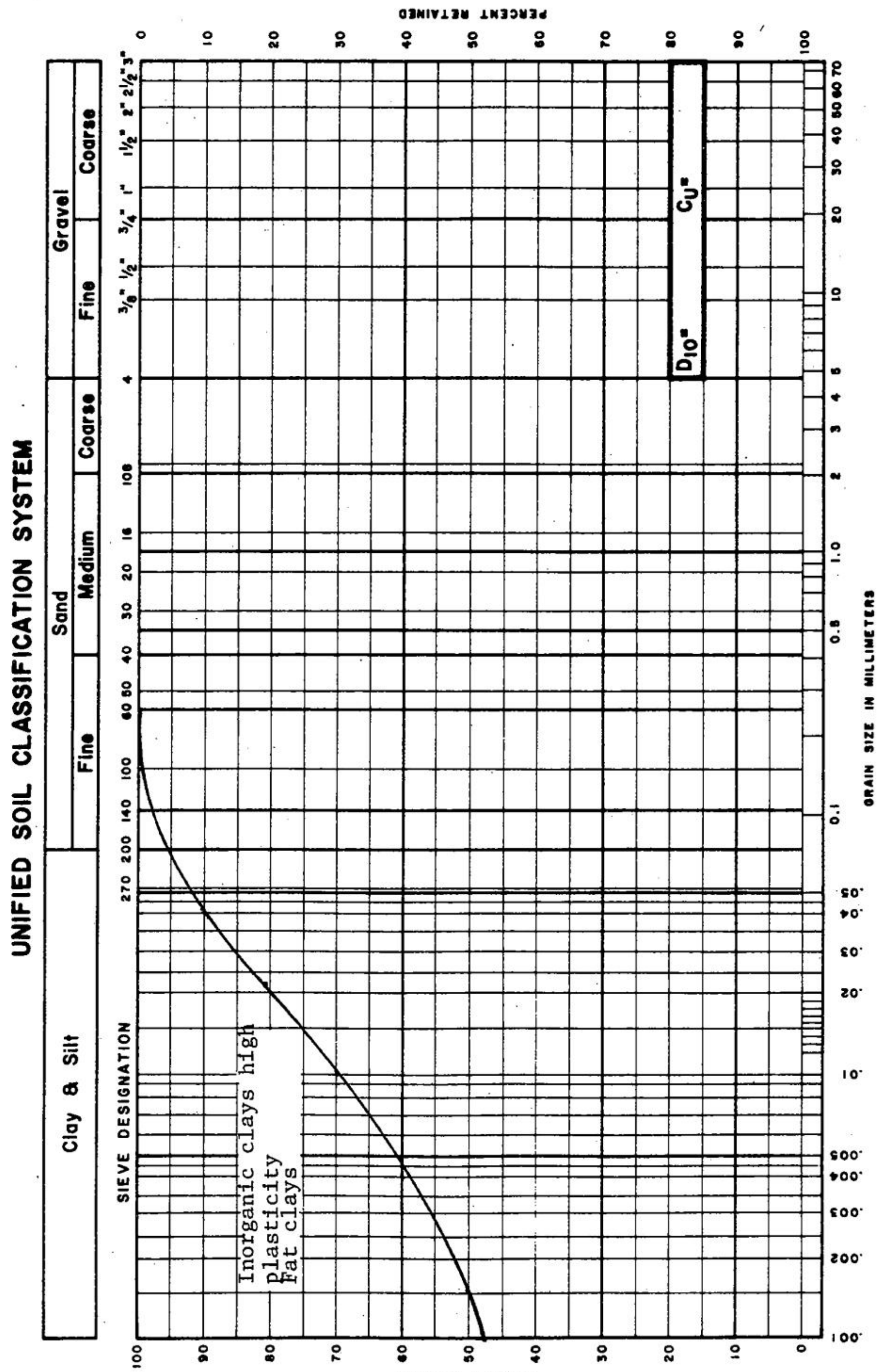


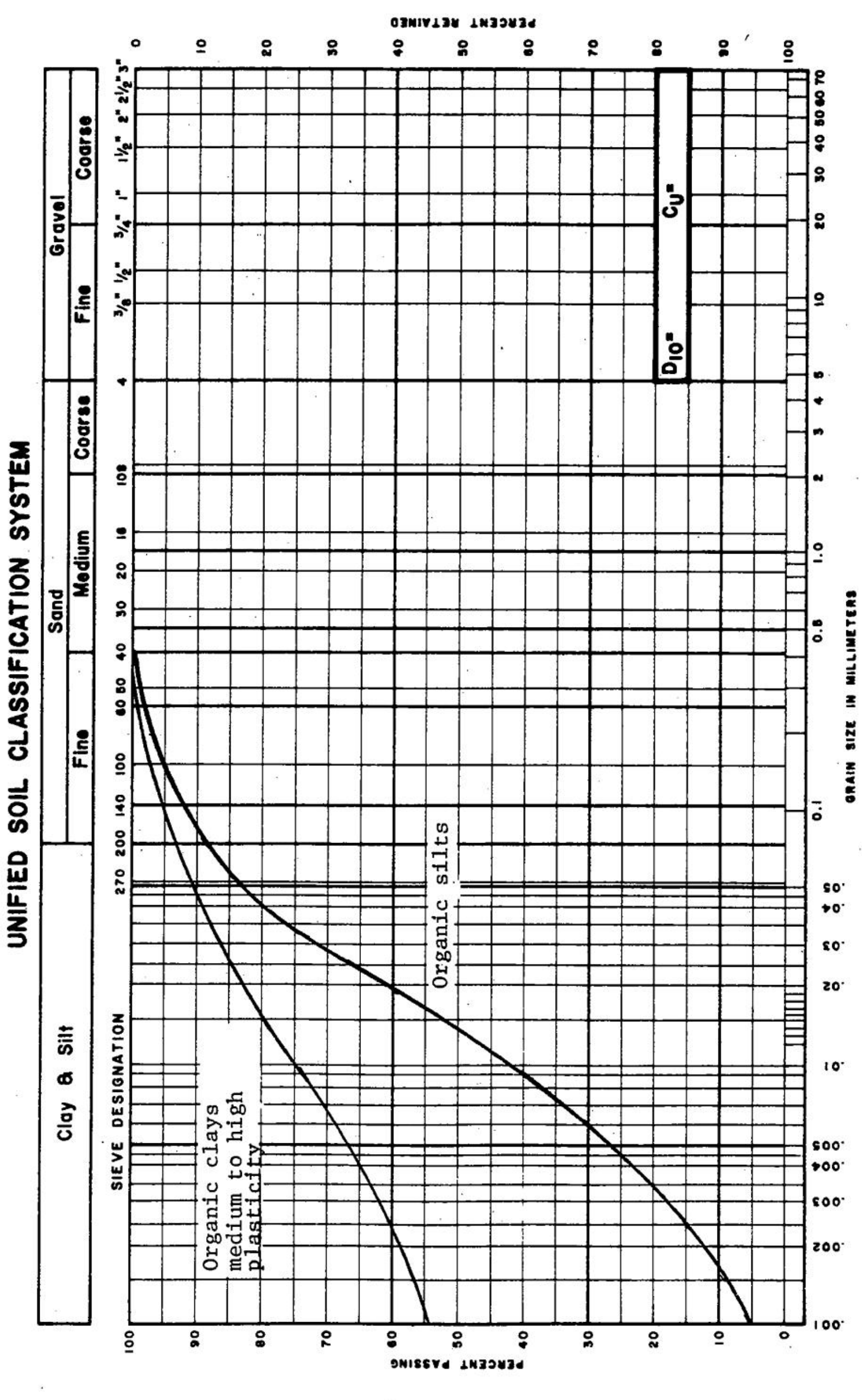
MH - Inorganic silts, micaceous or
diatomaceous fine sandy or silty
soils, elastic silts
Liquid limit over 50

0803 3/82



CH - Inorganic clays of high
plasticity - fat clays
Liquid limit over 50

0803 3/82



OH - Organic clays - medium to high plasticity

Organic silts
Liquid limit over 50

0803 3/82

LABORATORY SOIL TESTS

1 GENERAL

Laboratory soil tests may be performed to assist in deciding the percolation time "T" to be used in design. They may also be used in determining the maximum hydraulic capacity of a sight or area for one or more sewage systems. Laboratory tests are not normally required For, the review and design of small sewage systems unless marginal conditions exist and confirmation of field assessment is required. Such tests are normally carried out in the study of sites for subdivisions or individual large sewage disposal systems. Tests are carried out at the owners expense, normally by soil specialists or hydro-geologists experienced in the movement of liquids in soils. Tests may also be carried out by the Ministry's central and regional laboratories in cases of doubt, or for confirmation of the inspector's assessment in difficult cases, but this will not .be the normal practice.

2 SAMPLING FOR LABORATORY TESTING

(a) Desirably, samples should be obtained from each layer of soil that can influence the design of the sewage system. One or more should be obtained of the soil in which the absorption trenches will be located, and one of any different soil strata in the 0.9 metres below the trenches. The sample size depends on the type of testing to be carried out. Generally, a kilogram of soil is suitable for a disturbed soil sample. If an undisturbed sample is required, 200-250 millimetres of soil in a thin-walled Shelby tube of about 50 millimetres in diameter would be sufficient.

(b) DISTURBED SAMPLE

(i) Disturbed soil can be obtained from the auger taken out of the borehole or directly from the side walls of a test pit. Alternately, a soil sampler, such as a steel thick-walled tube, can be hammered into the soil deposit at the bottom of the hole created by the auger, and the soil sample removed from the sampler.

(ii) A plastic jar or sample bag, with a proper identification label, should be used to contain the soil sample. It should be shipped as soon as possible to the soil testing laboratory by private or public transportation.

(iii) Equipment needs for sampling are:

- Plastic jars or sample bags of I litre capacity and labels
- A backhoe for test pit excavation or, if not available, hand augers or a post hole digger.
- Pick and shovel

(c) UNDISTURBED SAMPLE - The sample can be obtained by a Shelby tube, about 50 millimetres I.D. and 300 millimetres long. Generally, the Shelby tube is used for soft to medium "clay" soils and should not be used for sandy soils. The sampling procedure is briefly described as follows:

(i) The tube must be connected to an adaptor which is in turn connected to a steel rod.

(ii) The tube is lowered into a borehole made by an auger of 75 to 100 millimetres in diameter. At the bottom of the hole, the tube is pushed into the soil slowly, using a lever system which can be set up temporarily with a rod, and a pipe wrench at the ground surface. If it is not possible to manually push (or lever) the tube into the soil, the tube must be forced into the soil with a hammer. This practice is undesirable, as it creates a fair amount of disturbance to the soil sample. To ease the "hammering" process, it is best to use a drop hammer with a hole at the centre. This hammer can be raised and dropped along the rod on the collar screwed on the rod. After the tube is forced into the soil, the rod is rotated 360°, using a pipe wrench, to shear off the soil at the sharp edge of the tube. To remove the soil sample and the tube from the ground, the "hammering" process, described above, is reversed; that is, the hammer is lifted upward against the collar.

(iii) After the tube is removed, its outside should be cleaned and the tube sealed with wax at both ends. A properly identified label should be glued to the tube, which is shipped to the soil testing laboratory.

(iv) For manual sampling, the equipment requirements are as follows:

- suitable hand augers (minimum 75 mm diameter) or post hole digger
- suitable pipe wrenches
- Shelby tubes
- adaptor to connect Shelby tube to steel rod
- steel rods
- collar
- drop hammer with a hole at the center.

(d) Labelling of samples - It is most important that the sample be clearly labelled or tagged in a manner that will be durable to withstand handling and shipping. The minimum information on the label should be:

(i) The location - town, municipality, etc.

(ii) The project - Name of project, subdivision or severance number

(iii) The property - Concession number, lot number, street address, owners name, etc.

(iv) The place on the property - Test pit or bore hole number, etc.

(v) Depth - The depth of the sample in the pit or borehole.

3 TYPES OF TESTS

A soils laboratory may perform any of a variety of tests. These include:

(a) Grain size distribution

(i) Sieve analysis
(ii) Hydrometer test

(b) Permeability test

(c) Moisture content

(d) Consistency - Atterberg limits

(i) Liquid limit
(ii) Plastic limit

(e) Plasticity index, shrinkage limit, liquidity index.

(f) Specific gravity

(g) Density measurement

The complete procedures for performing these tests can be found in textbooks and testing manuals on soils. A brief description is given below.

4 GRAIN SIZE DISTRIBUTION

The Sieve Analysis Test is used to determine particle size distribution of a coarse grained soil sample while the hydrometer test is used for a fine grained soil. Both are required for a complete analysis of a soil having all particle sizes. The grain size results are useful in classifying a coarse grained soil and in the determination of percolation time.

(a) Sieve Analysis - This is used to determine the particle size distribution of a coarse-grained soil sample, such as sand and gravel. The soil sample is dried and any aggregates or lumps broken down. It is then passed through a number of sieves with different size openings (e.g. No. 4 sieve, opening 5mm). The soil retained on each sieve is weighed and a grain size distribution curve can be obtained.

(b) The hydrometer test is used to obtain the particle size distribution of a fine-grained soil. This would apply to the fine-grained residual portion of a soil which has been sieved. A known weight of soil sample is thoroughly mixed with water, and the soil water mixture is put in a 1000 cc cylinder to let the soil particles

settle. By measuring the relative density of the soil-water mixture at various times with a hydrometer, it is possible to calculate the amount of soil particles remaining in suspension. Because the time for particles of certain size to settle to the bottom of the cylinder is known, the amount of particles in suspension, which are smaller than a certain particle size, can be determined. Hence, the particle size distribution of the soil sample can be obtained.

5 PERMEABILITY

(a) Under certain boundary conditions in the laboratory, water is passed through the soil sample and the amount of water passing through the sample in a certain time is measured. Together with the dimensions of the sample and the hydraulic gradient used in the test, the permeability of the soil sample can be calculated.

(b) For coarse-grained or cohesionless soils, a soil sample can be compacted in the laboratory for the permeability test. However, for fine-grained or cohesive soils, an undisturbed Shelby tube soil sample is required for testing because it is not possible in the laboratory to compact a soil sample so as to duplicate the structure the soil had in the ground.

6 MOISTURE CONTENT

The moisture content in a soil is expressed as a percentage of the weight of water in the soil to the weight of dry soil particles. The test is done by placing a wet soil in an oven at 105°C and leaving the soil to dry. The moisture content can be calculated by the weight of the wet soil and oven-dried soil.

7 CONSISTENCY - ATTERBERG LIMITS

(a) A typical soil mass has three constituents - soil grains, air and water. In soils consisting largely of fine grains, the amount of water present in the voids has a pronounced effect on the soil properties. Three main states of soil consistency are recognizable:

    (i) Liquid state in which the soil is either in suspension or has the nature of a viscous fluid.

(ii) Plastic state in which the soil can be rapidly deformed or remolded without elastic rebound, change of volume, cracking or crumbling.

(iii) Solid state in which the soil will crack when deformed or will exhibit elastic rebound.

(b) In describing these soil states it is customary to consider only the fraction of soil smaller than 0.4 millimetres (i.e. passing a No. 40 sieve). For this soil fraction the water content in percentage of dry weight at which the soil passes from the liquid state into the plastic state is called the "Liquid Limit". A device which causes the soil to flow under certain conditions is used in the laboratory to determine the Liquid Limit. Similarly, the water content of the soil at the boundary between the plastic state and the solid state is called the "Plastic Limit". The laboratory test consists of repeatedly rolling threads of the soil to about 3 millimetres in diameter until they crumble, and then determining the water content.

8 PLASTICITY

The difference between the Liquid Limit and Plastic Limit corresponds to the range of water content within which the soil is plastic. This difference of water content is called the "Plasticity Index" Highly plastic soils have high index values. In a non plastic or non cohesive soil the Plastic Limit and the Liquid Limit are the same and the Plasticity Index equals zero. Other factors being equal, a soil which has a large Plasticity Index and a large Liquid Limit is generally more impervious than a soil which has a smaller Plasticity Index and a smaller Liquid Limit.

9 RELATIVE DENSITY

The relative density of a soil is the ratio of the weight of air of a given volume of soil particles to the weight in air of an equal volume of distilled water at 4 °C. It can be determined for a soil sample by measuring the total volume and the weight of the soil particles in a flask.

10 DENSITY MEASUREMENT

The density of a clayey soil can be determined in the laboratory by measuring the volume and the weight of a soil sample, e.g. an undisturbed soil sample obtained by a Shelby tube. The density of sand can be measured in situ by the "balloon method" or the "cone method". More up to date practice involves the use of a nuclear densometre.

CHAPTER 7

CLASS 1, 2 AND 3 SEWAGE SYSTEMS

CHAPTER 7

CLASS 1, 2 AND 3 SEWAGE SYSTEMS

CLASS 1, 2 AND 3 SEWAGE SYSTEMS
GENERAL

1 INTRODUCTION

The sewage systems discussed in this chapter are ones which are often used under conditions where many of the amenities of the twentieth century are not available. Examples are for cottages or hunting cabins in remote areas where hydro is not available and a pressure water system does not service the dwelling. There are of course exceptions, but the field inspector should exercise caution before permitting the installation of these systems, in combination, as the method of treating all sewage. Circumstances in which these systems can be used are outlined in the following articles and in Chapter 15. Discretion should govern their use with new construction on land which cannot support a Class 4 or Class 6 sewage system.

2 CLASSIFICATION AND USE

(a) Class 1 sewage systems shall receive or be used only for the disposal of human body wastes. This classification includes various types of toilets and privies.

(b) Class 2 sewage systems shall receive or be used only for the disposal of sewage other than human body waste. A leaching pit is classified as a class 2 sewage system.

(c) Class 3 sewage systems shall receive or be used only for the disposal of the contents of a class 1 sewage. system, or effluent which has passed through a leaching bed which was in use before the regulations under Part VII of the Act were passed. A cesspool is classified as a Class 3 sewage system.

3 CERTIFICATE OF APPROVAL

A Certificate of Approval is required for a Class 2 or a Class 3 sewage system and must be issued before construction of the building to be served commences. Because of the simplicity of these systems, inspection of a completed system is not required and a "Use Permit" is not needed. Unlike other types of subsurface disposal system, these systems can be inspected at any time after construction to confirm that they comply with the regulations.

Only one Certificate of Approval is necessary if both a Class 2 and 3 sewage system are proposed to serve the same building.

4 DISPOSAL OF SEWAGE

The sewage contained in a chemical toilet, a pail privy, a privy vault, portable privy, or a recirculating toilet shall be disposed of in a Class 3 sewage system (cesspool), or in a Class 7 (hauled) sewage system. Similar requirements exist for the disposal of any liquid discharge from a composting toilet.

5 LOCATION OF SYSTEMS

The systems shown in column 1 of Table 7.1.1 shall not be located closer to the water supplies and surface waters shown in columns 2, 3 and 4, than the distances shown therein in metres.

TABLE 7.1.1
LOCATION OF CLASS 1, 2 & 3 SEWAGE SYSTEMS
clearances measured horizontally in metres

Column 1	Column 2	Column 3	Column 4
Type of System	Well with a water-tight casing to a depth of at least 6 metres*.	Other well, or a spring used as a potable water supply.	Lake, river, pond, stream, reservoir, or a spring not used as a potable water supply.
CLASS 1 Pit Privy	15 metres	30 metres	15 metres
Privy Vault) Pail Privy)	10 metres	15 metres	10 metres
CLASS 2 Leaching Pit	10 metres	15 metres	15 metres
CLASS 3 Cesspool	30 metres	60 metres	15 metres

* Information on the depth of casing is available from the well drilling logs of the Ministry and can be obtained from the Water Resources Branch.

CLASS 1 SEWAGE SYSTEMS

1 GENERAL

The following sewage systems are included in Class 1, and some are illustrated at Appendix 7.2.1 and 7.2.2.

(a) A chemical toilet
(b) A recirculating toilet
(c) An incinerating toilet
(d) A self contained portable toilet
(e) All forms of privy including a portable privy, an earth pit privy, a pail privy, a privy vault and a composting toilet system.

2 STANDARDS

A Class 1 sewage system shall be used only for the disposal of human body waste. Other matter, such as chemicals used to mask odours in some toilets or, in the case of composting toilets, vegetable or other biodegradable matter which the system is designed to receive to promote the decomposition of the human waste, may be added according to the manufacturers' recommendations. Waterborne sewage shall be excluded.

3 USES OF CLASS 1 SEWAGE SYSTEMS

(a) The use of a Class 1 sewage system is contingent upon the provision of a satisfactory waste disposal system to handle the waterborne sewage from plumbing fixtures, such as bath tubs, showers, hand basins, laundry tubs and kitchen sinks. This waste, which is exclusive of any human body waste, is frequently called "grey' water.

(b) A Class 1 sewage system may be used in conjunction with a class 2 sewage system to provide a total sewage system to an existing dwelling in which water usage is limited. Judgement as to proposed or existing water usage is necessary. For example, a Class 1 sewage system may be considered for a dwelling with a pressure water system providing the water use is limited to fixtures such as a kitchen sink and hand basins. If fixtures such as washing machines, dish washers, baths and showers are proposed initially, or installed

later, a leaching pit is generally inadequate and a Class 4, 5 or 6 sewage system is needed. If one of these sewage systems is installed, the use of a Class 1 sewage system may lose its appeal, as the regulation does not permit a reduction of the requirements of these sewage systems if they only receive "grey" water. The only remaining advantages in using a Class 1 sewage system would be to reduce the water usage and the cost of plumbing.

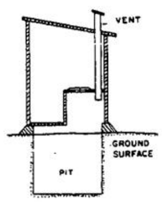
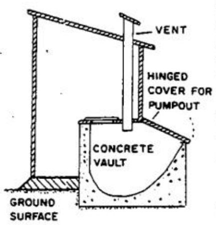
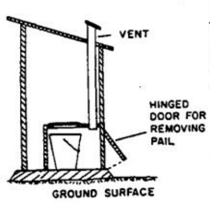
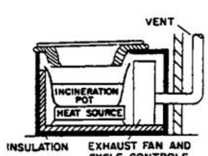
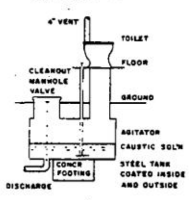
(c) Many residences, especially cottages, have sewage disposal facilities which were installed years ago, and which would not be acceptable by today's standards. Although perhaps adequate for the circumstances at the time of construction, they may have become overloaded as a result of improvements to the dwelling, changes in family occupancy, or installation of modern water using devices, to the point where breakdown has occurred. A variety of alternatives are possible. The whole sewage system may be replaced by a Class 4 or 6 sewage system meeting today's standards, or the existing facilities may be expanded to accomodate the increased sewage flow. These alternatives are the preferred solution, but may not be possible due to site restrictions, or only possible at excessive cost. The problem may be solved, however, by reducing the volume of waterborne sewage rather than by expanding the sewage system. This may be accomplished by removing the flush toilet and installing some type of Class 1 sewage system for treating human body wastes. This should reduce the overall sewage flow by 30-50%. The remaining waterborne sewage may not overload the existing system, or at least be reduced to a flow which would be acceptable, providing the improvements that can be reasonably made to the system are undertaken.

(c) Another instance where a Class 1 sewage system may be justified is where guest houses or cabins are used for sleeping only, and all other activities such as bathing, cooking and washing, are carried out at the main lodge or cottage. In this instance, the use of class 1 sewage systems for the convenience of the occupants may be permitted, whether or not the main water system is fully pressurized.

CLASS 1 SEWAGE DISPOSAL SYSTEMS

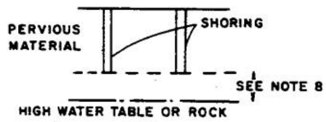
Class 1 systems are used only for the disposal of human body wastes and provision must be made to dispose of waste water to a separate sewage system. The conditions under which Class 1 systems are usually permitted are:

1) Where the installation of a standard septic tank and tile bed is not possible due to lot conditions
2) Where provision is made for the adequate disposal of the waste water to a completely separate system. Class 1 systems are not usually permitted if a premises is served by a pressure water system, as seepage pits usually can not adequately handle large flows.

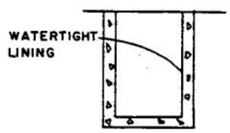
FACILITY	SUITABILITY	LOCATION	CONSTRUCTION	MAINTENANCE
Earth or Pit Privy 	Where soil is available the bottom of the pit should be 0.9 m above the high water table, rock or soil stratum of percolation time exceeding 25 mins/cm. The minimum clearance permitted by regulation is 0.6 m. Bottom of pit should be 0.5 m above high water table.	15 m to a well which has a solid watertight casing to 6 m below ground. 30 m to a spring or well other than a well with a watertight casing to a depth of 6 m. 3 m to any property boundary 15 m to any lake, river, stream, water course, pond, spring or reservoir.	Deep pit, insect and rodent proof. Earth mounded to prevent infiltration of surface water. Pit ventilated.	Good housekeeping required. Natural decomposition of waste should be relatively odourless.
Vault Privy 	Where adequate soil not available for pit privy and protection of ground water is required.	10 m to a well which has a solid watertight casing to 6 m below ground. 15 m to a spring or well other than a well with a watertight casing to a depth of 6 m. 3 m to any property boundary. 10 m to any lake, river, stream, water course, pond, spring or reservoir.	Watertight concrete vault. Flytight building. Ventilated vault and building. 0.2 cu. metres person/year.	Keep clean, flytight. Clean pit when contents approach within 50 cm of door. Disposal of contents to a Class 3 or 7 system.
Removable Pail Privy 	A temporary facility to protect water supply. Where pit privy is impractical.	Minimum distances as per vault privy.	As per vault privy. Provide easily-cleaned pails.	Provide regular collection service and cleaning facilities, including hot water, long-handled brushes, detergent, drained concrete floor. Disposal of contents to Class 3 or 7 system.
Incinerating Toilets & Composting Toilets 	To protect ground water and surface water supplies.	Indoors or adjoining main residence. Should not be used in close proximity to neighbours.	Unit requires a power source. Incinerating toilets also have a cycle time during which it can not be used.	Incinerated ash or dry compost may be disposed of easily, on garden, or buried.
Chemical Toilet 	To protect underground and surface water supplies.	Indoors or adjoining main residence.	As for masonry vault privy. Tank may be heavy gauge metal with protective coating. Capacity 550-1100 litres.	Use 4 kg of lye for each cu metre of vault capacity. Made up to 15 cm liquid depth in vault or 10 kg caustic soda per seat in 75 L water. Maintain chemical solution proper strength to keep odours down and agitate after each use. Clean vault when 2/3 - 3/4 full. Avoid splashing as solution causes burns. DWG No 7.2.1.

MINIMUM CLEARANCE DISTANCE

PRIVY	PIT	PAIL VAULT
WELL WITH A WATERTIGHT CASING TO A DEPTH OF 6 m	15 m	10 m
OTHER WELL OR SPRING (DRINKING WATER)	30m	15 m
LAKE, POND, RIVER, RESERVOIR, STREAM.	15 m	10m

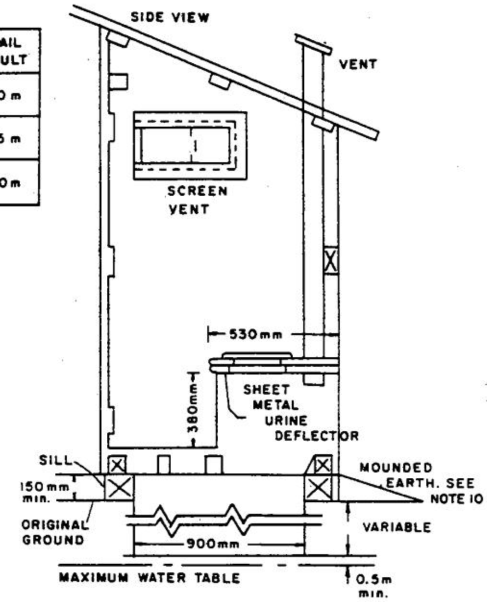


PIT



VAULT

SIDE VIEW



Note

1. Superstructure to be constructed of strong durable weather-proof materials.
2. Solid floor supported by a sill.
3. Equipped with one or more seats having covers supported by an enclosed bench.
4. Self closing door, at least one screened window for ventilation.
5. Bench or riser to be lined with an impervious material on all interior vertical surfaces.
6. Ventilating duct, screened at top, shall extend from underside of the bench to a point above the roof.
7. Sides of pit of pit privy shall be shored to prevent collapse.
8. Pit of pit privy shall be surrounded on all sides and on bottom with 0.6 m of earth and bottom of pit shall be at least 0.5 m above high water table.
9. Vault of vault privies shall be watertight.
10. The ground around all privies shall be graded to promote surface runoff away from privies and the bottom of the surface structure shall be at least 0.15 m above the surrounding ground.
11. The portable privy shall have a superstructure similar to other privies but it must be constructed to withstand the stresses subjected to it while loading and transporting it.
12. The portable privy must have a watertight receptacle for the storage of the sewage and it must be designed so that it can be easily cleaned and emptied.
13. Bottom metre of plywood structure should be covered by asphalt shingles or other suitable material to prevent animals from gnawing the wood.
14. Pit should provide an effective volume of 0.06 cu. metres/person/year for year round use.
15. Approximate dimensions 1 metre wide x 1.3 metres deep x 2.5 metres high. Pit to be 1 m x 1 m with variable depth.

MINISTRY OF THE ENVIRONMENT

CLASS I SYSTEM
PRIVIES

SCALE N.T.S.	
DRAWN BY J.B.M.	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 7.2.2.

CLASS 2 AND 3 SYSTEMS

1 CLASS 2 SYSTEMS - LEACHING PITS

The Regulation requires that a Class 2 sewage system shall receive or be used only for the disposal of sewage other than human body waste. The disposal of waterborne wastes, other than those originating from the water-closet, may be accomplished by the use of a leaching pit, providing of course, proper soil conditions exist in the area where the leaching pit is to be constructed, and water usage is limited.

2 USE OF CLASS 2 SEWAGE SYSTEMS

(a) Leaching pits provide a suitable system for disposing of "grey" water when the daily amount of such waste is small and site conditions are favourable. They are normally paired with class 1 sewage systems in more primitively serviced cottages where the water is hand carried, or, if the water system is pressurized, the connected fixtures are limited. Higher daily sewage flows soon overload a small leaching pit, or require pits of such proportion as to be impractical. In most areas where class 2 sewage systems are used the soil cover is limited. This further restricts their use in any situation but for low flows.

(b) Class 2 sewage systems are generally inadequate for use with pressurized water systems where showers, baths and water using appliances, such as washing machines, dish washers and garburetors are installed.

(c) With new construction, their use should be limited to:

(i) hunting cabins

(ii) seasonally used cottages in which the connections to the water system are limited to such fixtures as the kitchen sink (no garbage grinder) and hand basins. Should there be any likelihood of the owner, or subsequent owners, improving the property by connecting more water using fixtures or appliances, or by adopting all year occupancy, a Class 2 sewage system should only be approved initially if there is a suitable area on the property for the construction of a Class 4 or 6 sewage system,

which may be required at a later date. With all but the most remote cases this requirement will be normal (see also Chapter 15).

(iii) sewage disposal on a temporary basis, such as to serve a small construction or maintenance crew which moves on after a short stay in one location.

(iv) solving pollution problems at existing dwellings or establishments where the installed system is overloaded. In most cases the water system will be pressurized. Some possible solutions are discussed in Article 4.

3 DESIGN OF A LEACHING PIT

(a) The design of a leaching pit, like that of a leaching bed, depends on two factors.

(i) The permeability of the soil and

(ii) The volume of sewage to be treated.

(b) The sewage loading rate on the soil from a leaching pit, (expressed in litres per square metre), can be determined by the formula 400/T where T is the percolation rate of the soil in minutes per centimetre.

(c) The effective area of a leaching pit is the area of the sidewalls in contact with the sewage. This is the area below the inlet pipe. Bottom area is not considered in computing a pit's effective leaching area when sewage is fed directly to the pit. To promote maximum use of sidewall area for a given volume of sewage and soil conditions, the pit dimensions should be deep and of limited plan area. However, the soil cover is frequently shallow in many locations where leaching pits are proposed. As sidewall area is restricted because depth is limited, the pit dimensions for all except light sewage flows, would soon become excessive.

(d) The larger plan area is in relation to depth, the smaller the portion of the sidewall area that will be in contact with sewage. This results in a portion of the effective leaching area being constantly in contact with sewage, and this portion of the sidewall will be subject to clogging. For residences such as cottages, that are periodically occupied, this may not present a problem, as the sidewall area has a chance to "recover" when the cottage is unoccupied. It helps to explain the frequency of leaching pit failures where the dwelling served is occupied on a continuous basis.

(e) In order to provide for the proper disposal of the waste, a leaching pit should meet the following conditions:

(i) Have sufficient effective sidewall area to allow the sewage to infiltrate into the surrounding soil.
(ii) The bottom of the pit must be a minimum 0.5 metres above the maximum elevation of the ground water and 0.6 metres above any impervious stratum (T greater than 50) or rock in the area in which the pit is located.
(iii) The sides of the pit must be constructed in such a manner as to prevent their collapse, and be lined with open jointed material which will permit leaching from the pit.
(iv) Have a tight, strong cover.
(v) Earth around the top should be mounded a minimum of 0.15 metre to prevent surface run off from entering pit.
(vi) The pit must be surrounded on all sides by sufficient earth to prevent surface breakout of effluent. In no instance is there to be less than 0.6 metres of surrounding soil.

(f) The size of a leaching pit is based on providing sufficient side wall area so that the daily sewage flow will not overload the soil by exceeding the loading of 400/T $L/m^2.d$. The sewage flow will be related to the number of occupants, the number and type of fixtures connected to the leaching pit, and whether the water system is, or is not, pressurized.

(g) Pits may be constructed of varying shape although pits that are circular, square, or rectangular in plan are the most common. The circular or square shape permits the greatest volume for the least sidewall, resulting in economy of material used to retain the sidewalls. A long narrow pit provides the most sidewall for a

given volume. While it uses the most material to retain the sidewalls, the narrow width may simplify the cover design by reducing its span. A rectangular pit providing adequate sidewall, with a cover which is easily removed, is recommended.

(h) Design daily sewage flows per person, and for dwellings with varying numbers of bedrooms, are shown in Chapter 9, App. 9.3.1. These may be reduced to 30-50% if human waste is treated in a separate sewage system. The remaining flow is adequate for design where the water system is fully pressurized and water using appliances and fixtures are connected. Where connected fixtures are limited, or where the water system is not pressurized, a further reduction of sewage flow is warranted. Considering only "grey" water, a per capita design daily flow may range anywhere from 20 to 140 litres per day. Once a decision is made as to the design sewage flow and the percolation time of the soil, the size of leaching pit can be found by:

(i) Calculating the permissible soil loading as follows:

Soil loading in $L/m^2.d = 400/T$

(ii) Finding the sidewall area required below the inflow pipe as follows:

Sidewall area $(m^2) = Q/\text{loading} = QT/400$

(iii) Determining the perimeter measurement, depth and shape that will suite the location on the property, and will provide the required sidewall area.

(iv) Example: Assume a soil of T = 10 min/cm and a 2 bedroom cottage with 2 persons per bedroom. If the per capita design flow is assessed at 40 L/d then,

Loading = $400/T = 400/10 = 40\ L/m^2.d$

Sidewall area = $\dfrac{40 \times 2 \times 2}{40} = 4\ m^2$

If the overall depth to the bottom of the pit is 1.2 metres and there is 0.8 m below the inlet, the pit perimeter will be 4/0.8 = 5 metres. A rectangular pit of sides 1.5 m and width of 1 m would be adequate.

(v) The perimeter of the sidewall is measured at the soil/sewage interface, not on the inside of any material, such as concrete block or open-jointed brick, used to retain the sidewall.

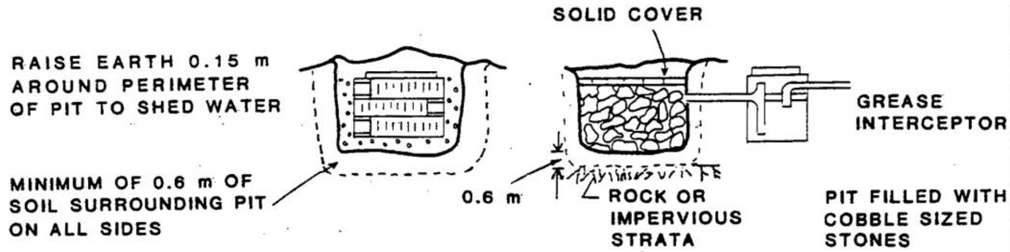
(vi) Regardless of the results of computations based on the above it is recommended that 1 m^2 of effective sidewall area be used as a guide for the minimum size of a leaching pit.

(vii) Design on the basis of 400/T would result in an excessive loading if a very low value of T is applied. Regardless of the estimated value of T for the soil, it is recommended that a minimum value of T = 4 be used in computing pit size.

(viii) The regulation requires that there be at least 0.6 metres of earth surrounding a leaching pit. It is recommended that this soil be of a type having a percolation time not more than 15 min/cm.

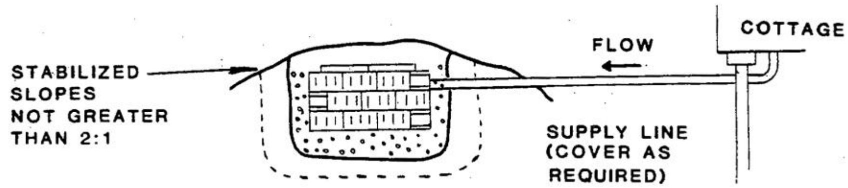
4 CLASS 3 SEWAGE SYSTEMS

A Class 3 sewage system shall receive or be used for the disposal of the contents of a Class 1 sewage system or effluent which has passed through a leaching bed which was in use before April 16, 1974. The design of a class 3 sewage system is the same as for the Class 2 sewage system discussed above. A typical Class 3 sewage system is shown in Drawing 7.3.2



PIT WITH CENTRE CORE OF CONCRETE BLOCK

STONE FILLED PIT WITH GREASE INTERCEPTOR



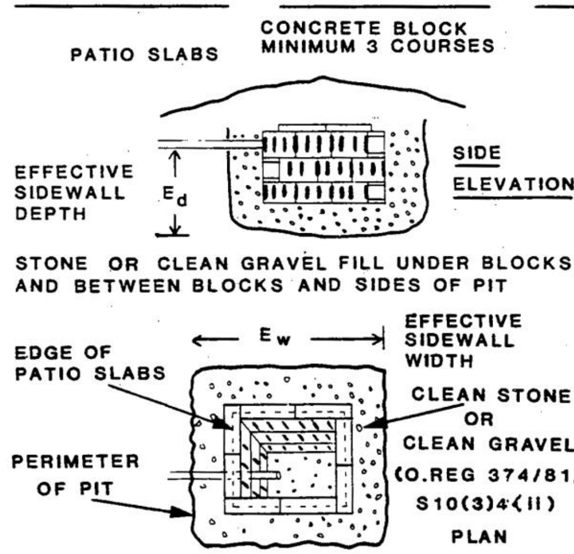
RAISED LEACHING PIT

Class 2 Sewage Systems—Leaching Pits

8.—(1) A prescribed standard for the operation of a Class 2 sewage system is that it shall be used only for the disposal of sewage other than human body waste.

(2) The following are prescribed as standards for the construction of a Class 2 sewage system:

1. The bottom of the pit shall be at least 0.5 metres above the high ground water table.
2. The pit shall be constructed in such a manner as to prevent the collapse of its sidewalls.
3. Any material used to support or form the sidewalls of the pit shall be an open jointed material of a type that will permit leaching from the pit.
4. The pit shall be provided with a tight, strong cover that shall remain over the pit except when it is necessary to remove it for purposes of adding sewage to or removing sewage from the pit or for purposes of maintenance of the pit.
5. The earth around the perimeter of the pit shall be raised or mounded to a height of at least 0.15 metres above ground level.
6. The surface of the ground in the area of the pit shall be so graded that surface drainage in the area will be diverted away from the pit.
7. The pit shall be surrounded on all sides and on its bottom by at least 0.6 metres of earth. O. Reg. 374/81, s. 8.



DETAILS: TYPICAL CONCRETE BLOCK LEACHING PIT

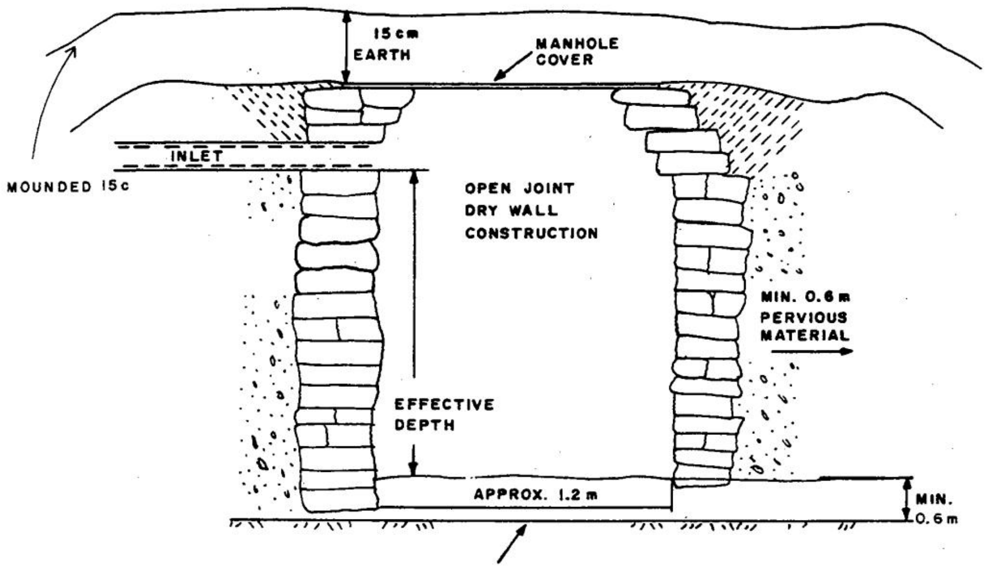
NOTE: BOTTOM AREA NOT INCLUDED IN COMPUTING LOADING

MINISTRY OF THE ENVIRONMENT

CLASS 2 SYSTEM

TYPICAL LEACHING PITS

SCALE N.T.S.	
DRAWN BY JBM	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 7.3.1.



NOTE

1. BOTTOM OF PIT MUST BE AT LEAST 0.6m ABOVE BEDROCK OR IMPERVIOUS LAYER.
2. SIDE OF PIT MUST BE CONSTRUCTED TO PREVENT COLLAPSE AND BE OF MATERIAL TO PERMIT LEACHING INTO THE SURROUNDING SOIL.
3. SIDES AND BOTTOM OF PIT TO BE SURROUNDED BY AT LEAST 0.6 METERS OF PERMEABLE MATERIAL.
4. EARTH AROUND THE PERIMETER TO BE MOUNDED AT LEAST 15cm ABOVE SURROUNDING GROUND LEVEL AND WHOLE AREA GRADED TO DIVERT SURFACE WATER AWAY FROM THE PIT.
5. PIT MUST HAVE A TIGHT STRONG COVER IN PLACE AT ALL TIMES EXCEPT WHEN ADDING OR REMOVING SEWAGE OR REPAIRING SYSTEM.
6. PIT MUST BE AT LEAST 30 m FROM A WELL WITH A 6 m CASING 60 m FROM ANY OTHER WELL AND 15 m FROM ANY LAKE, POND, RIVER, SPRING OR RESERVOIR.

MINISTRY OF THE ENVIRONMENT	
TYPICAL CESSPOOL	
SCALE N.T.S.	
DRAWN BY J.B.M.	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 7.3.2

USE OF CLASS I AND II SEWAGE SYSTEMS IN SOLVING POLLUTION PROBLEMS

1 GENERAL

Frequently, when an existing sewage disposal system is malfunctioning so as to cause a nuisance to health, or to be polluting the environment, examination will show it to be an old septic tank system, not designed to present standards. The system may be in need of servicing or repair, or may be seriously overloaded due to improvements made to the building it serves. The water system in the dwelling will most likely be pressurized and some modern water consuming fixtures and appliances installed.

2 CORRECTIVE METHODS

A solution should be found that will abate any environmental or health problem caused by the system and be the least disruptive to the occupants. This may be possible by using a Class 1 sewage system for human waste together with a modified form of Class 2 sewage system, or a sand filter for the disposal of all water borne wastes. The use of a class 1 sewage system as a replacement for any installed flush toilet should effect a 30-50% reduction in water usage. A figure of 140 litres per person per day can be used as a design figure for all "grey" water assuming fixtures such as whirlpool baths are not installed. Assuming the pressure system is retained, it remains to consider methods of disposing of this water using a maximum application rate of 400/T $L/m^2.d$ for "grey" water disposal. Some alternative solutions are as follows:

(a) Use the existing system for "grey" water disposal. Although overloaded when all sewage is applied it may be adequate to handle the "grey" water once the human waste is removed to another system.

(b) Use the existing system under different arrangements. These can include:

   (i) Use of the existing septic tank with a leaching pit providing there is adequate soil of T not greater than 12 mins./cm. With pretreatment of the sewage in the septic tank, the bottom area may be used in computing absorptive area. Installation to be in accordance with the requirements for Class 2 sewage systems. Unless the percolation rate of the soil is low, or the dwelling small, this solution may be impractical due to the size of leaching pit required.

(ii) Use the existing tank with a filter type leaching bed of the type and design specified in the Regulation. As the sewage flow has been reduced to about one half that of the normal design flow, the size of the filter may be reduced proportionally from the normal Class 4 sewage system standards.

(iii) In either (1) or (ii) above, if the existing tank needs replacement, or is inadequate to provide a minimum of 2 days retention, it should be replaced with a minimum size tank according to the regulatory requirements for septic tanks.

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8

CHAPTER 8

LEACHING BEDS

CHAPTER 8

LEACHING BEDS

8.1.1

LEACHING BEDS - GENERAL

1 LEACHING BEDS - PRINCIPLES OF OPERATION

The leaching bed is the most critical part of a sub-surface sewage disposal system. The septic or aerobic treatment tank and other parts of a sewage system such as a grease trap, siphon or pump chamber, and the piping and distribution box or header, are either to provide treatment of the sewage prior to its absorption in the soil or to deliver the sewage to the bed in a manner most suited to its efficient operation. Drawing 8.1.1 illustrates a typical layout and details of a small leaching bed. The disposal of sewage in the soil through a leaching bed involves two principal functions;

(a) treatment of sewage in the leaching bed,

(b) absorption of the treated liquid by the underlying and surrounding soils without breakout to the surface.

2 TREATMENT OF SEWAGE IN THE LEACHING BED.

Prolonged application of sewage to a soil surface results in the formation of a biomass at the soil/sewage interface. Bacteria in the biomass feed on the organic matter. Treatment also takes place as the sewage percolates downward and is exposed to bacterial action in the soil pores. The downward movement must be slow enough to provide sufficient time for this action to result in an acceptable level of treatment of the sewage before it enters the, water table, or reaches rock or a soil of unacceptable permeability. This degree of treatment, combined with the regulatory clearances to lot lines, surface waters, wells, buildings, etc., is necessary to protect the environment and public health. The soil in the treatment zone is specified by regulation as to minimum depth and to both minimum and maximum percolation times, in order to ensure continued satisfactory operation. Important considerations in the treatment zone of a leaching bed are;

(a) A sufficient area of soil surface in relation to the soil's characteristics is necessary so that it can absorb the applied sewage on a continuing basis without clogging at the soil/sewage interface. (See also Article 6.2. concerning the infiltrative and percolative capacity of soils).

(b) As the required area of soil/sewage interface in (a) is computed from the maximum sewage loading and the percolation time of the soil on which it is applied, it follows that the sewage must be applied as evenly as possible over the entire surface. Excess sewage application or uneven distribution will clog the interface and prevent the sewage from entering the treatment zone. The maximum practical size of a leaching bed will be controlled in part by the optimum arrangement of distribution piping that will provide for even distribution.

(c) Coarse grained soils provide inadequate treatment. A minimum percolation time of 1 minute per centimetre has been set for the soil in the treatment zone of a leaching bed. A percolation time of 2 minutes per centimetre is recommended as a minimum for soil imported as fill. Where coarse natural soils exist it may be necessary to add finer grained soils in the leaching bed, or to require greater clearance distances to wells or surface waters than the regulatory minimums. This is of greater importance when applied to the shoreline properties of sensitive lakes, where it is desired to prevent phosphates entering the lake.

(d) Fine grained soils may resist percolation. Once saturated, they do not drain readily. Replenishment of oxygen in the treatment zone is slowed. A maximum acceptable percolation time for soils in this zone is 50 minutes per centimetre.

(e) Silica sands do little to attenuate the passage of phosphates while clay soils are generally quite effective.

(f) The most suitable soil for a leaching bed is therefore a compromise, possessing to a degree the advantages of both the fine and coarse grained soils while avoiding their disadvantages. Natural soils having percolation times in the 4 to 18 min/cm range would be representative of good conditions.

<u>3</u> SUB-SURFACE ABSORPTION OF TREATED SEWAGE

(a) General - Continued acceptance of treated sewage in the soil underlying, the treatment zone, or in surrounding permeable soils where rock or a relatively impervious underlying soil forces lateral movement, is vital to the continued successful functioning of a leaching bed. If the input of sewage exceeds the capacity of the site to receive and transmit sewage, mushy ground, or breakout of sewage to the surface, will result. This is a common cause of failure in sewage systems, especially in large systems, as the problem increases with increasing daily sewage flows.

(b) Mounding - When the downward percolating sewage reaches the level of the water table or rock, or a soil strata of higher percolation time than that in the treatment zone, it will "mound" on top of this level until it develops sufficient head or pressure to force continued downward movement, or lateral movement, or both. The greater the resistance of the underlying soil to vertical percolation, the greater the portion of the liquid that will move laterally. The liquid will in fact join the ground water moving in the aquifer, or will form its own saturated zone as it moves laterally over an imperious stratum. The resistance to lateral movement is a function of the depth of the aquifer, the permeability of the soil in the aquifer and the topography. The greater the resistance, the higher the sewage will mound under the leaching bed. If the mound rises to the level that will flood the soil/sewage interface it will remove oxygen from the soil pores in the treatment zone of the bed. It may also cause back up of sewage in the system. In extreme cases, particularly if the leaching bed is raised, it may result in breakout to the surface, usually at the toe of the slope of the raised portion.

(c) Size Limitations - The hydraulic capacity of the site of a leaching bed to receive and transmit the applied sewage on a continuing basis without breakout is the major factor in limiting the maximum size of a leaching bed, or the concentration of separate leaching beds in a given area. This capacity may be called the transmissivity of the site. Guidelines respecting size limitations are contained in Articles 4 and 5.

(d) Leaching bed orientation - As the daily sewage flow increases, the size of a leaching bed increases, but the per proportion to the problem of lateral movement in shallow soil layers surrounding a leaching bed. The problem is accentuated on sloping sites where it is important to adopt a leaching bed layout having the longest dimension at right angles to the direction of movement of ground water, and to ensure that an adequate depth of permeable soil (soil mantle) exists in that direction. Minimum requirements are contained in the regulation.

4 TYPES OF LEACHING BEDS

Standards for leaching beds are set by Regulation. There are two principal types of leaching beds used with sub-surface disposal systems:

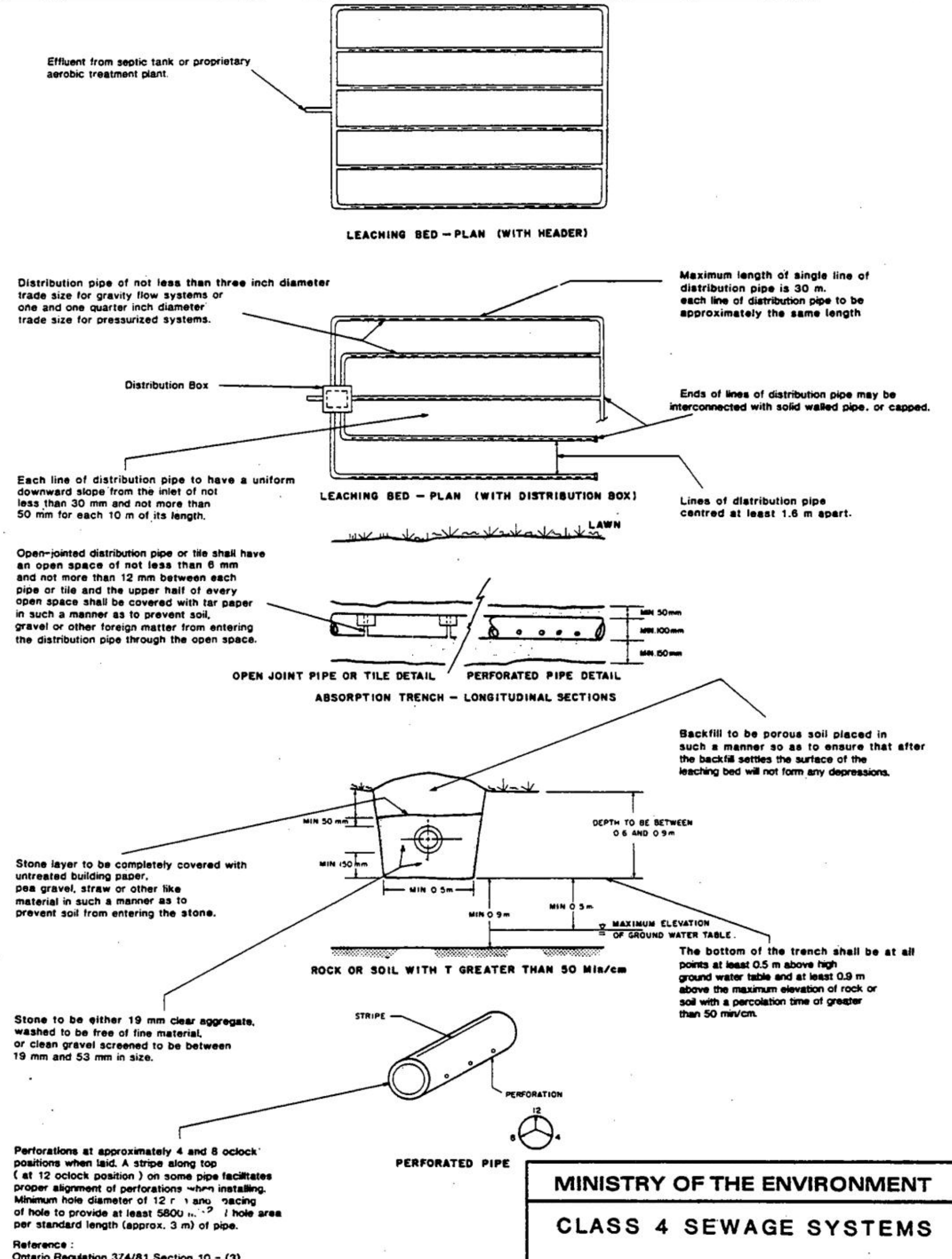
(a) Absorption trench beds - these are the conventional beds comprised of absorption trenches, each separated from the other and containing a length of distribution pipe set in a layer of stone. These beds may be set into the natural soil when the soil and other conditions permit, or may be raised to meet the required standards where site conditions are adverse.

(b) Filters - in these beds the distribution pipes are not in separate trenches but are set on a continuous layer of stone in a layout that will spread the sewage evenly over the surface of the filter medium. The material used as the filter medium is specified as to quality and depth. The filter must be sized in relation to the quantity of sewage applied and the pattern of its delivery to the filter. A loading rate is established which, considering the characteristics of the sewage and the filter medium, can be sustained without clogging of the filter medium.

5 DESIGN CRITERIA

The design criteria for leaching beds for various types of sewage systems are outlined in the Regulation. and in the Chapter in which the type of sewage system is covered. One requirement that is common to all leaching beds is that all liquids, other than the sewage it is intended to treat, should be

excluded from entering the sewage system. Storm water should be kept out of the leaching bed by such means as shaping the surface to shed water and constructing swales, ditches or interceptor drains if necessary to divert surface or sub-surface water from entering the bed area. Care must be taken to ensure that such diversions are not detrimental to the interests of others. System installation should be such as to prevent the infiltration of ground water into treatment tanks and pump chambers or into the piping which leads to the leaching bed. Other general considerations are discussed in Article 2 respecting the, location of leaching beds.



MINISTRY OF THE ENVIRONMENT	
CLASS 4 SEWAGE SYSTEMS	
TYPICAL DETAILS– SMALL LEACHING BEDS	
SCALE N.T.S.	
DRAWN BY J.M.	DATE JAN. 1982
CHECKED BY R.A.W.	DRAWING NO. 8.1.1.

LEACHING BEDS - LOCATION

1 LOCATION WITH RESPECT TO WELLS OR SURFACE WATER

(a) By regulation, no weeping tile of perforated pipe can be closer than 15 metres to a well with a watertight casing extending at least 6 metres below ground, 30 metres to all other wells, and 15 metres to any lake, river, reservoir, stream or pond. The clearance to a spring is either 30 metres or 15 metres depending on whether it is, or is not, a source or potable water. These are minimum acceptable distances. Owners of property are advised to locate wells uphill from leaching beds, and leaching beds as far back from surface waters as is practicable. All distances should be measured horizontally. Where raised leaching beds are concerned, the distances previously stated are to be increased in the proportion of 2 metres for each metre that the bed is elevated above the ground lying between the bed and the object in question. Inspectors assessing a property may require greater distances than the minimums if, for example, there is a very coarse granular soil overlying rock between the proposed leaching bed and a stream or body of water.

(b) The question is frequently posed as to what constitutes a watercourse, especially when considering natural streambeds or man made drainage channels, which may be dry except for short periods after heavy rain or during spring break-up. This is a matter of judgement but the following is offered as guidance:

(i) if the natural or man made watercourse carries water frequently, or if any period of it carrying water is of more than 1 week, and its bottom is below the level at which the pipes in the leaching bed will be located, then it should be judged a stream and the 15 metres minimum clearance applied. Most natural watercourses, where the flow has carved a definitive channel, would require the clearance unless there is good reason to decide otherwise.

(ii) if the level of the distribution pipes will be below the bottom of the natural or manmade channel, the 15 metre clearance need not apply. A shallow swale may be in this category even though it carries water after any heavy rain. A point to consider in such cases is the potential damage that the water flow may do to the leaching bed. For example, abnormal flow in a shallow swale may spread laterally so as to inundate the land in the area of the bed or cause the water table to rise in the bed. If so the bed should be at a distance from the “watercourse" (not necessarily 15m) considered appropriate to prevent this occurrence.

(c) Where the level of water in a lake, river or stream is subject to change so that the shoreline from which the clearance distance should be measured varies significantly, the decision as to the "shoreline" from which the clearance should be measured is one of judgment based on records and local knowledge. This is of concern in assessing applications for subdivision and severance and for Certificates of Approval for sewage systems. In deciding the "shoreline" from which to measure the clearance, the following points should be considered:

(i) Are there bylaws, established to enforce Official Plans, or to meet the needs of agencies such as Conservation Authorities, which restrict construction in relation to high water marks? In some areas the records of storms, such as Hurricane Hazel, have been used to set such bylaws. Should they exist the water elevations they prescribe should be used in Part VII assessments. It is hoped that these flood levels can be physically identified at the site. If bylaws exist, a plan of subdivision should already have taken into account any flood stage restrictions in the bylaw.

(ii) Knowledge of water levels reached by annual or periodic high water in rivers or lakes. In some rivers the high water period may only last a few days. In the Great Lakes the high to low water cycle may span several years.

(iii) The conditions that would be encountered if the sewage system was located using clearances from shorelines or river banks when "normal" water levels prevail.

- If an in-ground leaching bed were inundated, or a raised bed surrounded by shallow flooding, no health hazard should exist providing the flooding is short lived (not over 1 week), or the building served is unoccupied. The sewage system could continue to function if the sewer elevation was above the level of the flood waters. The situation could be accepted if no damage to the sewage system would occur due to current, wave erosion or ice or drift carried in the stream.

- If the flooding is of short duration, but could be damaging to the sewage system, or create a health problem, during this period, all construction of the sewage system should be outside of the flooded area.

- If the flooding is of long duration, clearance distances should be measured from the high water mark at flood stage.

(iv) For a Certificate of Approval for sewage system correction on an existing developed lot - Assess the problem considering the above factors and come as close to the recommendations in (iii) above as permitted by the circumstances.

(e) The flood elevation considered in the assessment can be substantiated by physical evidence such as water marks on trees, fence lines, etc. It is not necessarily the "high water mark" as may be referred to in legal documents. Should a legal interpretation of "high water mark" be necessary, the following extracts from "The Encyclopedia of Words and Phrases - Legal Maxims -Canada 1825 -1978, 3rd Edition" may be of assistance:

(N.B.) In the absence of any evidence of local usage or custom to the contrary, the words "high water mark", as used in the description of lands in a deed, should be construed as meaning the ordinary high water mark, not high water mark at freshet.

Lee v. Arthurs (1919, 48 D.L.R. 78; 46 N.B.R. 482.

(Ont.) "High water mark" is defined as the space next to the bank which is sometimes not occupied by the river when reduced by heat in the summer season. It is not part of the bank, but of the bed. Village of New Hamburg v. County of Waterloo (1893), 20 O.A.R. 1.

(Ont.) In interpreting a patent of land described as being to the "high water mark" of the St. Lawrence River, the true limit to be taken would appear to be, by analogy to tidal waters, the average height of the river after the great flow of the spring has abated, and the river is in its ordinary state. Plumb v. McGannon (1871), 32 U.C.Q.B.8.

(f) The temporary flooding may raise the level of ground water under the absorption trenches. While the separation of trench bottom from high ground water is a separate consideration from horizontal clearances, the inspector will have to judge if it is warranted to use this temporarily raised ground water table in the design of the leaching bed. Its duration and frequency will be the best guidance in this consideration.

2 LOCATION WITH RESPECT TO BUILDING OR STRUCTURES

The distribution pipe in a leaching bed is to be at least 5 metres from any building or structure. This requirement is to reduce the likehood of contamination of the basement by the leaching bed, or contamination of the footing drainage tile which is normally connected to a storm sewer or nearby open ditch. For raised beds the 5 metre clearance is to be increased in the proportion of 2 metres for each metre of elevation of the bed above the ground between the leaching bed and the building. All clearances are to be horizontal distance. Consideration may be given to accepting a reduction in the clearance if the distribution pipe is at a lower level than the lowest floor of the building served.

3 LOCATION WITH RESPECT TO LOT LINES.

(a) Distribution pipes in a leaching bed are not to be within 3 metres, measured horizontally, of a property boundary. In the case of raised beds this distance is to be increased by 2 metres for each metre of elevation of the bed above the surrounding ground located between the bed and the lot line.

(b) The siting and construction of a leaching bed raised above the natural ground level should not cause problems to neighbouring properties. For example, the side slopes of raised beds, and any mantle of permeable soil required in the direction of ground water movement away from the leaching bed, shall be contained within the property, or the requirements of the regulation concerning easements for any portion contained on a neighbours property must be met.

(c) Natural surface drainage, whether in a confined channel or not, should not be blocked by the construction of a leaching bed in a manner which will adversely affect a neighbour's property, or be diverted by the bed onto a part of a neighbour's property on which it did not previously flow unless the neighbour consents in writing. A property owner may take the position in a particular case that he has a legal right to block or redirect drainage not confined in a channel, but the Director has a responsibility under the Act not to approve a sewage system which will unduly interfere with any use that can be made of a neighour's land (part of the natural environment - see clause 66(e) of the Act).

4 LOCATION WITH RESPECT TO ROCK OR SOIL STRATA OF PERCOLATION TIME GREATER THAN 50 MINUTES PER CENTIMETRE.

(a) Regulatic.. 374/81 prohibits the location of a leaching bed in a soil of percolation time exceeding 50 min/cm. The term "unacceptable" soil may be used in this guideline to describe such soils while the term "acceptable" soil may be used to describe a soil of percolation time in the range of 1 to 50 minutes inclusive.

(b) The regulation requires that the bottom of an absorption trench or the surface of a filter medium be not less than 0.9 metres above rock or an unacceptable soil in all parts of the leaching bed.

(c) Where rock or unacceptable soils underly acceptable soils in the area of a proposed leaching bed, an assessment of characteristics and depth of the acceptable soils in the area should be made to ensure that there is a minimum of 0.25 metres of acceptable soil mantle in the location of the proposed bed and for 15 metres from the outer distribution pipe in any direction in which, the sewage will move in the soil away from the bed.

(d) An in-ground leaching bed requires approximately 1.5 metres of acceptable soil, 0.9 metres under and 0.6 metres above the surface to which sewage is applied. If the mantle of acceptable soil is too shallow for an in-ground leaching bed, the bed may be elevated above ground line by the importation of soils to the level necessary to meet the requirements. The natural soil mantle referred to in (c) must be stable and will usually support growth. If it is not at least 0.25 m in depth, soil must be added to meet this requirement. The added soil must also be stabilized.

(e) Where rock, or an unacceptable soil, is at the surface, the site can be considered satisfactory only if the raised leaching bed and its surrounding mantle can be stabilized and breakout prevented. A property having sloping bare rock, where the site cannot be regraded to receive the fill, will generally be unacceptable. Added fill must be protected against erosion by sodding or seeding. Until growth is established, protection may be obtained using straw, wood chips, bark, etc.

5 LOCATION WITH RESPECT TO FISSURED ROCK

The presence of prominent solution channels or fissures in the rock is normally associated with water soluble sedimentary rocks such as limestone. Channels or fissures occurring beneath a leaching bed may cause "piping" or short-circuiting of the effluent within the leaching bed where the bed material is carried by water erosion into the fissure. Where this happens the sewage will not receive proper treatment. Generally, this does not occur when the leaching bed is constructed in soil which is in place naturally to a depth of 1.5 metres or more over fissured rock or where a partially raised bed is required over an existing but shallow soil cover. Where a raised bed is required because there is less than 1.5 metres of acceptable natural soil cover, the decision to permit construction or to reject the proposal, is a matter of judgment based on the evidence at the site. The following guidance is offered:

(a) if an inspection of the natural soil surface over the bed area shows no evidence of subsidence or solution channels, it can be assumed that any fissures below the surface in that area are not significant, or are filled with soil, and the leaching bed may be constructed in accordance with the requirements for raised beds in Article 4. The full required depth of bed must be assured.

(b) if there is evidence on the surface of subsidence or solution channels, but these are minor, then they can be sealed with a layer of clay placed before the fill material for the bed is added.

(c) in both (a) and (b) the area in which effluent from the bed will flow laterally should be examined for subsidence or apparent solution channels for at least 15 metres from the bed in the direction of effluent movement, and any minor fissures sealed as for the bed area.

(d) if inspection of the bed area and the area of effluent flow discloses significant subsidence, or well developed solution channels, it is unlikely they can be effectively sealed and the site should not be approved.

6 LOCATION WITH RESPECT TO HIGH GROUND WATER TABLE

(a) Regulations require that the bottom of the absorption trench, or the surface of a filter medium, must be a minimum of 0.5 metres above high ground water table in all parts of the bed. Water table at a particular location and time can be defined as the upper surface of the zone in which the soil was found to be saturated with ground water when the inspection was carried out. Obviously the water table can vary as, for example, the different level at which it may be found at the time of thaw and spring run-off, or after heavy rain, or after a summer of hot dry weather.

(b) The high ground water elevation to be determined from inspection for design purposes is the highest elevation at which there is physical evidence that the soil has been saturated with water. It would be wrong to ignore all signs that a relatively high ground water table exists for part of the time merely because no ground water was found at the time of inspection. Some considerations are:

(i) signs such as vegetation common to wet areas, organic soils, water marks, together with the knowledge of the area held by inspectors or local residents, should indicate any areas subject to inundation after rains, or that are marshy, or which have prevalent high water tables. The general topography, the land drainage pattern and the level of water in

ditches are good indicators.

(ii) ground water follows the variations in surface topography in areas adjacent to lakes, rivers and ditches, and the ground water table will correspond to the surface water level unless the surrounding soils possess high capillarity (silts), in which case the ground water may be appreciably higher in the soil than the elevation of surface water. This would be more common in a poorly drained field adjacent to a drainage ditch than it would be in land bordering a lake.

(iii) the examination of soils from boreholes or in test pits can give an indication of water table. Soils showing a reddishbrown or yellow-brown mottling pattern are likely subject to changing wet and dry conditions. Solid grey damp silts and clays are indications of a soil which is generally wet and devoid of oxygen in its pores. (See also Article 6.1)

(iv) should there be a significant difference between the highest elevation of ground water known to exist and the high water table recorded for most of the year, the water table selected for design should take into consideration the surroundings and the nature of the proposed development.

(c) When the selected water table elevation requires the raising of a bed the design considerations for raised beds, outlined in Article 4, should be followed.

7 LOCATION WITH RESPECT TO TREES

The area of the leaching bed should be generally free of trees and bushes so that the bed is well aired and sunlight is permitted to reach the surface. Trees should only be permitted within the area of the bed if it is judged that no damage will occur from the roots considering the size and type of the trees and the arrangement of the distribution pipe runs. Willows of all kinds and silver maples are examples of trees of rapid growth, high water consumption and root proliferation, which should not be allowed in the bed area.

DISTRIBUTION OF SEWAGE TO LEACHING BEDS

1 DISTRIBUTION SYSTEMS

Sewage from a septic tank or proprietary aerobic treatment plant flows through a distribution system prior to its application to the soil absorption surface in the leaching bed. Components of such a system include:

(a) the piping connecting the tank to the distribution box or header which splits the flow to the distribution pipes, including, if required,

(i) a siphon or pumping arrangement to dose the leaching bed, or

(ii) a pumping arrangement to lift the sewage to a higher elevation whether or not dosing of the leaching bed is required.

(b) distribution boxes or headers to split the flow to segments of the leaching bed, or directly to each line of distribution pipe.

(c) the lines of distribution pipe.

2 GRAVITY FLOW AND PRESSURE DISTRIBUTION SYSTEMS

(a) Gravity flow - Gravity flow in the distribution pipes occurs in sewage systems where,

(i) the treatment tank is of the flow-through type displacing to the leaching bed an amount equal to the inflow to the tank, and the pipe connection between the tank and the leaching bed is a gravity flow line. This connecting pipe should be of 3 or 4 inch trade size, corresponding to the size of distribution pipe, and laid to a gradient of not less than 1 vertical in 50 horizontal. This type of system is a trickle flow system.

(ii) pumps are used to overcome a grade differential between the treatment tank and the leaching bed, in which case a pump moves the tank effluent in batches to the header or distribution box. While the force main will be under pressure the

flow in the distribution lines will not. As an alternative, a sewage pump in a sealed chamber receiving the raw sewage can be used to pump to a treatment tank and leaching bed located at a higher elevation. Pumps suitable for tank effluent are more economical to purchase and operate than raw sewage pumps. There are circumstances, however, when it may be preferable to utilize a raw sewage pump. An example would be where, because of shallow rock or a high water table, it is not practical or advisable to bury the tank to a depth that will permit gravity flow to the tank from the lowest fixture in the residence, and it is better to set the tank at an elevation permitting gravity flow to the leaching bed. In such cases a sewage pump located in a sealed chamber in the dwelling may be used to pump sewage to the tank (and thus to the leaching bed) in batches. A similar arrangement may be installed to avoid locating the treatment tank, or a pump chamber, at an elevation where high ground water could result in infiltration into the tank or chamber. This type of delivery should not be confused with dosing of a leaching bed (see iii). Connecting pipe should be selected to suit the conditions at the site and provision made for back flow or draining of the lines as required.

(iii) dosing of the leaching bed by pump or by siphon is adopted. The Regulation requires dosing for any absorption trench leaching bed having more than 150 metres of distribution pipe. A dosing system provides for the holding of tank effluent in a pump or siphon chamber sized and equipped with controls so as to periodically deliver a measured volume of the tank effluent to the leaching bed in a limited time. This periodic "flooding" of the leaching bed provides for more even distribution of the sewage over the entire bed area than is achieved by trickle or small flow discharges and permits the bed to drain between doses. During this interval aerobic conditions are present to promote strong bacterial action in the biological mat that develops at the soil sewage interface. Pipe used in a dosing system is selected to suit the site conditions, and the pumps (or siphon) are selected to meet the dosing arrangements adopted in design. Provision for draining of the force main should

be included. As flow in the distribution lines from the header or distribution box will normally be by gravity, this delivery should not be confused with pressure distribution. Dosing methods are more fully covered in Article 6.

(b) Pressure distribution systems - In such sewage systems the tank effluent is pumped from a collecting chamber in periodic measured doses to the leaching bed in a manner that will ensure that all parts of the distribution pipe network will be under a positive head throughout the delivery cycle. A minimum pressure of not less than 6 Kpa should be maintained at the terminal end of all lines of distribution pipe. Distribution systems should be professionally designed, particularly where large systems are considered. Site conditions affect the location, layout and elevation of the pipe layout. The volume of each dose and the time period of its delivery can be varied. Computations in design will also include such variables as the number and length of distribution pipe laterals selected, the size and spacing of perforations, pipe diameter and type, the number and type of pipe fittings and the characteristics of any pumps considered for the job. This method of delivery provides the best assurance of achieving even distribution of sewage to all parts of a leaching bed. More details are provided in Article 6.

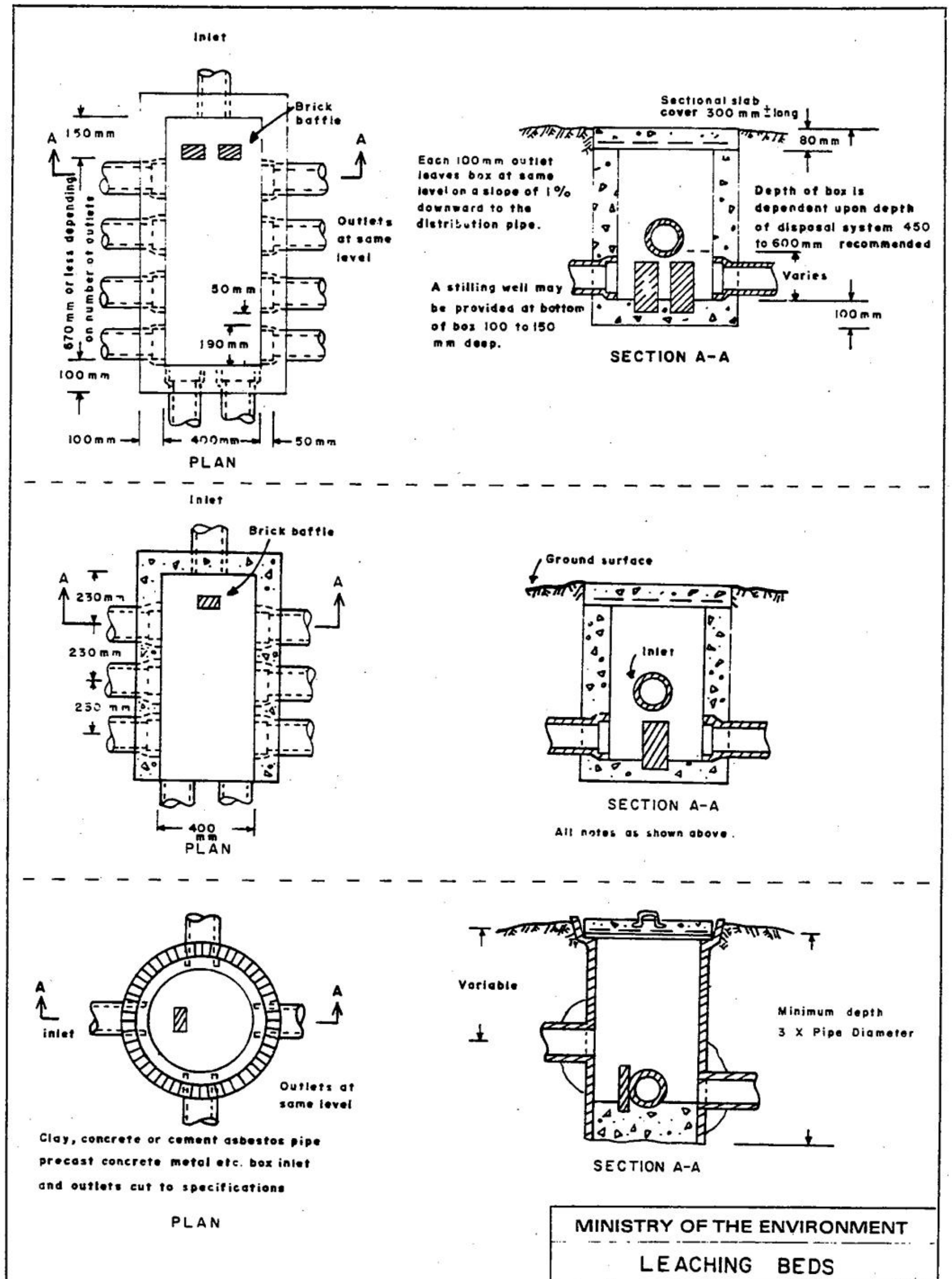
<u>3</u> HEADERS AND DISTRIBUTION BOXES

(a) Opinions vary on the choice of distribution boxes versus headers. The experience of some inspectors has been that a properly constructed and levelled distribution box, from which each outlet pipe leads directly to a single line of distribution pipe, provides a more even distribution than a header, since even distribution to more than two runs from a T connection cannot be assured. Other inspectors have experienced difficulties with the installation of distribution boxes to ensure that the correct invert level of the out-flowing pipes is obtained. They prefer a header, as the connection of lines to it are fixed and it is easier to level. It appears that either method is satisfactory for smaller systems where the number of lines of distribution pipe is limited. In general, distribution boxes are recommended for larger systems as they have the added advantage that they can be inspected, cleaned and adjusted after the bed has been constructed.

(b) A leaching bed on a sloping site may be constructed with the absorption trenches at successively lower elevations. This is an alternative to leveling an area for the bed to ensure that all trenches are at the same elevation. Serial distribution, and the distribution box method of achieving this, are outlined in Section 8.4.6. The maximum slope for such methods is 25%.

(c) A header pipe must be installed on firmly packed soil to prevent differential settlement. The pipe linking a header to a tank, or to another header, or to a distribution box, should be connected to the centre of the header. There should be an even number of distribution lines arranged symmetrically on both sides of the connection. There should be no absorption trench directly opposite the point of connection.

(d) Distribution boxes should be placed on a firm foundation not subject to frost heaving or settlement. A concrete pad may achieve this purpose or a footing must be carried down to the required depth. All outlets from a distribution box must be at the same elevation. The box should have a removable cover to facilitate inspection and adjustment of the outlets if required and should be protected from frost or damage from other causes. Drawing 8.3.1 shows a typical distribution box design.



MINISTRY OF THE ENVIRONMENT

LEACHING BEDS

TYPICAL DISTRIBUTION BOX DETAILS

SCALE N.T.S.

DRAWN BY J.B.M. DATE JAN 1982

CHECKED BY R.A.W. DRAWING NO. 8.3.1

ABSORPTION TRENCH LEACHING BEDS

1 GENERAL

(a) Absorption trench leaching beds consist of a grouping of lines of distribution pipe, each line laid in a separate trench, into which effluent from a septic tank or proprietary aerobic treatment plant is fed for treatment and disposal to the soil. The lines of distribution pipe are composed of lengths of perforated pipe joined together or may be of open-jointed tile. The incoming sewage is split by means of a header pipe or a distribution box so as to deliver an even quantity to each absorption trench and thus utilize the whole of the leaching bed. A typical layout of a small leaching bed is shown in Drawing. 8.1.1.

(b) The contents and requirements of the regulation and Articles 1, 2 and 3 are applicable.

2 ABSORPTION TRENCH DETAILS

(a) The regulation sets out the requirements for the construction of absorption trenches which are illustrated in Drawing 8.1.1. Trenches shall be,

- (i) not more than 30 metres in length,
- (ii) approximately the same length,
- (iii) at least 0.5 metres in width,
- (iv) between 0.6 and 0.9 metres in depth as measured from the finished grade. A deeper trench may be considered as an exception to the regulatory maximum if a small increase in depth would penetrate a more permeable soil horizon, providing the separation distances above rock or unacceptable soil (8.2.4(b)) and high ground water table (8.2.6.(a)) can be maintained,
- (v) centred at least 1.6 metres apart.

(b) The regulation does not specify a maximum width of trench. No reduction in the distribution pipe requirements is granted if trench width exceeds 0.5 m. A practical maximum width of 0.75 m is recommeded in order to conserve on stone quantities, while the unexcavated width between trenches should not be less than 0.9 m.

(c) The slope of the bottom of the trench is not set by regulation. It should not be steeper than the slope of the distribution pipe and, preferably, should be shallower, or level, although this will require more than the minimum 150 millimetres of stone under the high end of the pipe.

(d) The regulation requires that distribution pipe shall be,

(i) not less than 3 inch diameter trade size for gravity flow systems or 1 1/4 inch diameter trade size for pressurized systems (see section 3),

(ii) placed or installed in a layer of stone covering the trench bottom, at least 0.5 metres in width, which is either 19 millimetres clear aggregate washed to be free of fine material, or clean gravel screened to be between 19 and 52 millimetres in size, so that there is at least a depth of 0.15 metres of stone below and 50 millimetres of stone above the pipe,

(iii) placed with a uniform downward slope from the inlet with a drop of not less than 30 millimetres and not more than 50 millimetres for each 10 metres of its length,

(iv) if comprised of open jointed pipe or tile, installed with an open space of not less than 6 or more than 12 millimetres between each pipe or tile, and the upper half of every open space covered by tar paper to prevent soil, gravel or other foreign matter from entering the distribution pipe.

(e) The upper surface of the stone layer is covered by a layer of untreated building paper, pea gravel, straw or other like material, so as to prevent soil used as backfill from entering the stone layer. The paper used must be free of holes or tears as it is important to ensure that the backfill soils do not enter and plug the voids in the stone.

(f) The backfill above the trenches should be a porous soil so as to permit air to infiltrate the leaching bed. The trenches should be overfilled so that, after settlement of the soil, there will be no depressions above the trenches. The surface should be topsoiled and seeded or sodded to prevent erosion.

3 LAYOUT OF ABSORPTION TRENCHES IN A LEACHING BED

(a) The sub-surface conditions, site topography and location of the leaching bed on the property will have the greatest influence on the number and arrangement of the absorption trenches once the total length required has been determined. There is often more than one workable arrangement and opinions vary as to the best design, such as the use of headers vs distribution boxes, or the maximum number of lines of distribution pipe that it is practical to connect to a single header if all are to be loaded evenly. Obviously, the manner in which the sewage is delivered to the leaching bed, e.g. by trickle, dosing or pressure distribution, will influence the matter.

(b) An even distribution to each absorption trench is achieved when the sewage flow delivered to the leaching bed is split only once into even amounts which are then led directly to each line of distribution pipe. Each additional time that flow is split by a header or distribution box the probability of achieving even distribution on a continuing basis is reduced. This is particularly true in the construction of larger leaching beds where, in some proposals, it is planned to split the flow several times or, alternatively, to have an excessive number of lines tying in to one header. The more complex the lay out the greater the chance of subsequent differential settlement which will disrupt the operation of the bed.

(c) In small leaching beds which are frequently fed by trickle flow one header or distribution box will suffice. Even distribution over the length of each absorption trench is not achieved, due to the fluctuations in the incoming load, and the entire length of trench is progressively utilized over the period of its useful life as the portions initially receiving most usage become overloaded. This suggests that in trickle fed leaching beds the lines of distribution pipe should be kept relatively short.

Those of the maximum permitted length should only be used where reasons so dictate as, for example, on sloping sites where a long narrow leaching bed, with its length transverse to the slope, is desired. It is also preferable to locate the flow splitting device centrally in the bed with lines leading outward from this point. This is especially recommended for beds in which the absorption trenches are raised above ground (see also Section 4).

(d) End connections - The ends of lines 0f distribution pipe may be individually capped or, where all lines are at the same elevation, it is preferable to interconnect their ends using a non-perforated pipe. Should sewage at any time overload one line of distribution pipe this connection will help to balance the distribution of sewage to the other lines in the segment of the bed where they have been interconnected.

(e) In medium to large sewage systems the arrangement of absorption trenches is more significant. Some typical layouts are shown in Drawing 8.4.1. for medium size systems and in Drawing 8.4.2 for a large system. The following suggestions are made as guidance in deciding the best arrangement:

(i) keep the number of times flow is split to a minimum. Splitting flow not more than twice before leading directly into a line of distribution pipe is recommended.

(ii) the more distribution lines connected to a header which has a single point supply of sewage the less chance of each line taking an equal load of sewage. It is recommended that no more than 6 lines of distribution pipe be connected to a header which receives sewage from one supply pipe. In trickle fed or medium sized leaching beds no more than 2 is preferable. -

(iii) absorption trenches should be arranged symmetrically on both sides of any point where flow is split.

(iv) absorption trenches are normally oriented to be transverse to the slope.

(v) In large dosed leaching beds, the bed should be constructed in two halves, each fed by a single force main from a pump chamber in which two pumps are installed to operate alternately. The force mains should have a cross connection which will permit either pump to dose either half of the leaching bed.

4 RAISED ABSORPTION TRENCH LEACHING BEDS

(a) Introduction - in order to meet the requirements of the regulation respecting the depth of absorption trenches and their minimum elevation above rock, a soil of "T" greater than 50 mins/cm, or high ground water table, it may be necessary to raise the level of the absorption trenches. If so, the surface of the bed will be raised above the ground level. Soils imported in order to construct the bed will normally be of a granular nature obtained from sand or gravel pits. The soil that will form the backfill above the stone layer in the trenches, and any topsoil that will form the backfill above the stone layer in the trenches, and any topsoil used in preparing the surface for planting, may be any porous soil such as a sandy loam. The percolation time of the soil which is imported as the fill in which the absorption trenches will be located must be assessed, as it will either be the percolation time used in the design of the leaching bed, or will be considered in its determination. A typical raised bed is illustrated in Drawing 8.4.3.

(b) Design requirements. - For any leaching bed, or part thereof, which must be raised to the point where the soil surrounding the trenches is above grade, the regulation requires that:

(i) the upper 0.25 metres of soil which will underly the raised portion of the leaching bed, and extend for at least 15 metres beyond the outer distribution pipes in any direction in which the bed effluent will move laterally in the soil away from the bed, must not have a percolation time less than 1 or more than 50 mins/cm. This can be referred to as the soil mantle. If the natural soil mantle is a soil of higher percolation time, or if it does not meet the 0.25 metre depth over the required area, fill must be imported in order to create the required base for the raised bed. This soil mantle is important to the proper functioning of the sewage system. The area it occupies should be maintained and be free of anything that will obstruct the in-ground

disposal of the liquid or evapo-transpiration from its surface.

(ii) If the percolation time of the soil in the 0.25 metre mantle exceeds 15 mins/cm, the percolation time of the fill material in which the absorption trenches will be located, and which is placed on top of the mantle, shall not be less than 75% of the percolation time of the soil in the mantle. For example, a natural soil mantle of percolation time assessed at 40 would be in the acceptable range, but would require the fill material to have a percolation time not less than 30. As it is generally not practical to use soils of this type as fill, the use of this "75"% rule will likely be limited to soil mantles of percolation time not exceeding 20-25.

(c) The rules in (b) are basically to prevent a coarse fill, and therefore a small leaching bed of short retention time, being placed directly onto rock or a relatively impermeable soil of T greater than 50 mins/cm, as such construction results in breakout in or around the bed.

(d) Most granular fills that are not excessively coarse will have a percolation time in the range 2 to 8 mins/cm. If these soils are used for the leaching bed it would be necessary to import fill for the mantle as well as the leaching bed in any case where the natural mantle had a percolation time exceeding 15 mins/cm. Fill for the mantle will normally come from the same source as that for the leaching bed.

(e) The rules in (b) do not affect the requirement that the trench bottom must at least 0.9 metres above rock or soil of T greater than 50 mins/cm, and 0.5 metres above high ground water table. However the following points should be noted:

(i) the regulation prohibits construction of a leaching bed in imported soil unless the 0.25 metres of mantle is unsaturated. While strictly this could permit saturation of all or part of this depth at the period of highest ground water elevation, providing it was not saturated when the fill is

placed, the intent is that the mantle should be above the water table existing for any appreciable period.

(ii) the elevation of the trench bottom with respect to that of the surface of the 0.25 metre mantle can vary as shown in Appendix 8.4.1, and this will affect the selection of the percolation time to be used in determining the length of distribution pipe required. This is not necessarily the percolation time of the imported fill as it depends on the soils existing in the 0.9 metres below the trench bottom (see Section 6.3.5).

(f) Side Slopes - The side slope adopted must be gentle enough to ensure stability of the material. Slopes of 4:1 or 3:1 will normally *suffice and* combine to give protection against erosion and a smooth transition between the natural ground elevation and the mound. By regulation the steepest slope permitted is 2:1 (2 horizontal to 1 vertical). All slopes should be sodded or seeded to prevent erosion and provide stability. Where a site selected for the leaching bed is restricted, and the 2:1 minimum slope cannot be achieved without encroachment onto neighboring property, gabions or other means may be used to form a low retaining wall at the toe *of* the slope. A wall *of* this type is only to retain the lower part of the slope and its base should not be bonded to shallow rock or impervious strata in a manner that will cause the sewage, or precipitation, that has passed through the bed, to pond and exert pressure. The construction must allow free passage of this treated sewage through the soil mantle. It is suggested that any wall over 4 feet in height should be designed by a qualified engineer to ensure its stability and compliance with the above.

(g) The 0.25 metre mantle, natural or added, is an essential part of the sewage system. Soil added to form this mantle should be contained completely on the property on which the building served by the sewage system is located. The regulation sets out the requirements for an easement in a case where any part of such added mantle will be on neighboring property.

(h) Placement of fill - It is important that the work of preparing the site to receive the fill, and the placing and compaction of the fill, be carried out in a manner that will not change the characteristics of the on-site or imported soils on which the design was based. The best approach depends on the circumstances found at the site. It is common practice to remove any vegetation and the organic topsoil before placing the fill. The topsoil can eventually be used to cover the bed, and any added mantle, prior to sodding or seeding. Some points respecting the placing of fill are;

(i) when the existing upper 0.25 metres of soil that will underly the bed is an acceptable mantle, the fill for the leaching bed can be placed directly on it without prior levelling if the slopes on the site do not exceed 10%. For steeper slopes in the 10-25% range-an area to receive the fill should be leveled or benched. If this is done then the 0.25 metres of soil underlying the leaching bed will be the upper 0.25 metres of the leveled area. It is not good practice to construct a leaching bed partly on a leveled area cut into the slope, and partly on fill extended over the natural slope, as unequal settlement may result. Wheeled vehicles should be kept off the bed and mantle area. The removal of vegetation and topsoil where fill will be placed should be done by hand or with light tracked equipment so as to cause the least disruption to the retained soil. The soil that will underly the fill should be scarified at right angles to the slope before fill is placed. Fill should be dumped to the side and progressively pushed over the prepared site and compacted in layers, preferably by light tracked equipment. This process should continue until the level of the top of the trench is reached, prior to excavation of the trenches and placing of stone. Drawing 8.4.4 is illustrative of the above.

(ii) when fill must be placed to create the 0.25 metres of soil mantle the procedures for protection of the soil on which it is placed should be similar to those covered in (i). When a mantle is placed on uneven rock it should fill the hollows first and then be placed to ensure the minimum 0.25 metres of depth over the required area.

(iii) if fill is spread and compacted in layers of not more than 0.25 metres, compaction by the spreading equipment will usually suffice. Depending on the fill material and the overall depth of fill, it may be desirable to leave the fill in place for a period of time before preparing the absorption trenches. The longer this period, the less likelihood that settlement will occur after the pipes are installed. Over the winter would be ideal for deep fills. The needs of occupancy will rarely allow this desirable situation to happen and, unless the inspector judges a settlement period is essential and makes this a condition of the Certificate of Approval, construction of the bed can proceed. It does emphasize the need for careful compaction during placing of the fill.

5 LIMITATIONS FOR RAISED ABSORPTION TRENCH LEACHING BEDS

The regulation provides the minimum requirements for the soil mantle and for fill imported to construct a leaching bed, but does not specify a relationship between the soil comprising the mantle and the underlying soil or rock. No indication is given as to maximum size of a subsurface disposal system, or any circumstances in which the minimum clearance distances are considered inadequate. Decisions require judgment based on an application of the requirements of the regulation to the conditions found at the site. Guidance respecting maximum size is contained in Section 8. As raised beds are constructed where the site conditions are not ideal, some points of limitation on their use, and recommendations respecting their use in certain circumstances, are as follows:

(a) At rocky sites, typical of the Canadian Shield, where there is little or no soil cover, the feasibility of constructing the soil mantle is a judgment of whether or not it can tie into such soil cover and growth as exists to form a stable mantle in which growth can be promoted. It is considered impractical to place a granular fill for a mantle on top of bald rock where there is no soil sustaining growth in the surrounding area, particularly if the rock is smooth and sloping. Such sites should be rejected.

(b) In more level terrain, where there is little or no soil cover above a rock strata or soil of high percolation time, the minimum requirements of mantle in the regulation may be less than required to prevent breakout at the edge of the mantle. In such cases extension of the mantle to cover an area such that the sewage loading on the soil does not exceed 4 to 5 litres per square metre per day may be a solution, providing there is some assurance that the effluent from the leaching bed can be evenly spread over such an area. Even distribution, and increased absorption into the soil below the mantle, may be promoted by light plowing or scarifying of this soil before the fill forming the mantle is placed. A series of shallow trenches may also be used. This work should be done along a line at right angles to the movement of effluent from the bed.

(c) While the regulation permits fill material to be any soil of percolation time not exceeding 50 mins/cm the excavation, transportation, placing and compaction of fine grained soils is not generally practical, and most fill material will be in the granular soils range with a percolation time not usually exceeding 12 mins/cm. In circumstances as described in (b) above, a mantle of soil of T in the 6 - 12 min/cm range will be preferable to one of lower T value as it will promote longer retention and more evapo-transpiration.

(d) The minimum requirements of the regulation respecting clearances and soil mantles have been provided essentially for residential or small commercial sewage systems. When considering larger sewage systems, the construction of soil mantles and leaching beds on heavy clay soils by the importation of fill becomes less and less practical as the size increases. Beyond the reasonable limits of liquid absorption on the site, alternative sewage disposal methods should be adopted. (see also Section 8).

6 ABSORPTION TRENCH BEDS ON SLOPING SITES

In lieu of preparing a level base for a conventional leaching bed on a sloping site special methods of construction may be used in which the runs of distribution pipe are laid transverse to the slope along the contour

lines and are not installed at a common elevation. These methods may be used for small systems for slopes not exceeding 25% and are outlined hereunder:

(a) Serial Distribution Method - In serial distribution each trench, or pair of trenches, is connected to the next by a tightly jointed relief line laid on an undisturbed section of ground as shown on Drawing 8.4.5. The arrangement is such that all effluent is discharged to the first trench until it is filled. Excess liquid is then carried by means of a tightly jointed line to the succeeding, or lower, trench. In that manner each portion of the leaching bed is used in succession. When serial distribution is used the design and construction procedures are as follows:

(i) the length of distribution pipe required is the same as for conventional beds.

(ii) the bottom of each trench and its distribution pipe should have a relatively level grade.

(iii) absorption trenches should follow approximately the ground surface contour lines to avoid variations in trench depth.

(iv) other than as noted in this section, the absorption trench details should conform to the requirements of the regulation - see Dwg. 8.1.1.

(v) adjacent trenches will be connected with a relief line, with or without a drop box arrangement, in such a manner that each trench is filled with septic tank effluent to a level where the pipes are approximately three-quarters full before effluent flows to the next trench.

(vi) relief lines should be tightly jointed, with direct connections to the distribution lines in adjacent trenches, or to a drop box arrangement.

(vii) care must be exercised in constructing relief lines to ensure an undisturbed block of earth between-trenches and backfill should be carefully tamped.

(viii) the incoming and outgoing relief line connections to each trench should be as far from each other as is necessary in order to prevent short-circuiting. 1.2 to 2.4 metres is suggested. The point of connection to each trench should be as near the centre of the trench as these staggered connections will allow.

(ix) the level of the overflow pipe in the first relief line must be at least 0.1 metres lower than that of the septic tank outlet.

(b) Distribution Box Method - In this method, each line of distribution pipe is connected to a distribution box. The purpose of this arrangement is to dose each line equally thus preventing one line from being overloaded. Drawing 8.4.6 illustrates this method. The following design and construction procedures should be followed,

(i) the distribution box must be firmly supported in a manner to avoid settlement or frost heaving,

(ii) the trench direction should follow approximately the ground surface contour lines so that variation in trench depth will be minimized,

(iii) absorption trench details should conform to the requirements of the regulation - see Dwg 8.1.1, and

(iv) the end 0f each line of distribution pipe should be capped.

<u>7</u> DESIGN OF ABSORPTION TRENCH LEACHING BEDS

(a) Site inspection - The following points have a direct bearing on the acceptability of a site for a leaching bed, and on its design, and should be assessed by an inspector reviewing a proposal:

(i) Soils and water tables - Test pits 1.5 metres deep, or to rock, are required in the proposed site so that the soil strata can be assessed, and the elevation of high ground water table for use in design determined. Examination of

auger holes is considered a minimum. Soil investigation is also necessary in the area covered by the soil mantle in order to confirm its compliance with requirements.

(ii) Drainage - the proposed site should not be subject to surface run-off from other areas, or the design should include provisions for diverting any such run-off as would impair the functioning of the leaching bed. Similarly, ground water movement which could saturate the leaching bed should be diverted. This condition is prevalent on sloping sites where the soil in which the leaching bed is located is granular, or is a soil containing sand layers or lenses, and is underlain at shallow depth by a soil resistive to infiltration.

(iii) Topography and slope stability - Soil conditions in and around the area of the proposed leaching bed should be stable. On sloping sites, soils having a natural cover of trees and vegetation, which may be stable under normal conditions of precipitation, may become unstable when the vegetation is cleared, or because of the daily volume of liquid which is added to the soil. The sitting of a leaching bed too near the edge of a steep slope on which there is evidence of soil subsidence (e.g. old slides, cracks in the soil surface, fallen or tilted trees, etc.) should be avoided. Slopes in silty soils and some clays, or a mixture of such soils with granular veins or lenses, are the most prone to subsidence (e.g. leda clays in eastern Ontario).

(iv) Clearances - the clearance distance to neighbouring properties and to surface waters, wells, etc. should be checked. The clearance from streams or bodies of water may require some investigation to determine the mark from which such clearance should be measured (Section 8.2.1(c)).

(v) Local information and knowledge of conditions and the success, or failure, of sewage systems installed in similar conditions.

(b) In-ground or raised leaching bed - This is determined from the data obtained in (a). If an in-ground bed, it must be decided whether it will be constructed with all lines of distribution pipe at the same elevation, or if one of the slope design alternatives outlined, in Section 6 will be adopted, or if the bed should be segmented, in which case the lines of pipe in each segment would be at a common elevation, but the segments may or may not be so.

(c) On sloping sites, should the bed, or segment thereof, be built on the natural slope or should the area first be leveled or terraced prior to construction. Drawing 8.4.4 shows some alternatives.

8 MAXIMUM SIZE OF ABSORPTION TRENCH LEACHING BEDS

(a) There are three principal factors affecting the maximum size of an absorption trench bed;.

(i) the large amount of distribution pipe required. and the problem of designing and constructing a leaching bed that will achieve and maintain even distribution of sewage throughout the bed,

(ii) the hydraulic capacity of the site,

(iii) any adverse effects that the concentration of a large amount of sewage may have on an aquifer.

(b) Physical limitations - The formula used to determine the amount of distribution pipe required is based on the permissible loading of sewage on a soil of the type in which the absorption trenches are located. A design based on this formula assumes an even distribution of sewage over the entire bed so that the loading is not exceeded in any segment. While small systems can get away with progressive loading in a trickle fed bed, large dosed leaching beds cannot. Following the recommendations in Section 3, a practical maximum size of leaching bed may be one in which the force main serving one half of the bed supplies sewage to a distribution box having 8 outlets. The line from each outlet would lead to a header or distribution box splitting the flow to no more than 6 lines. There will be a total of 48 lines in each

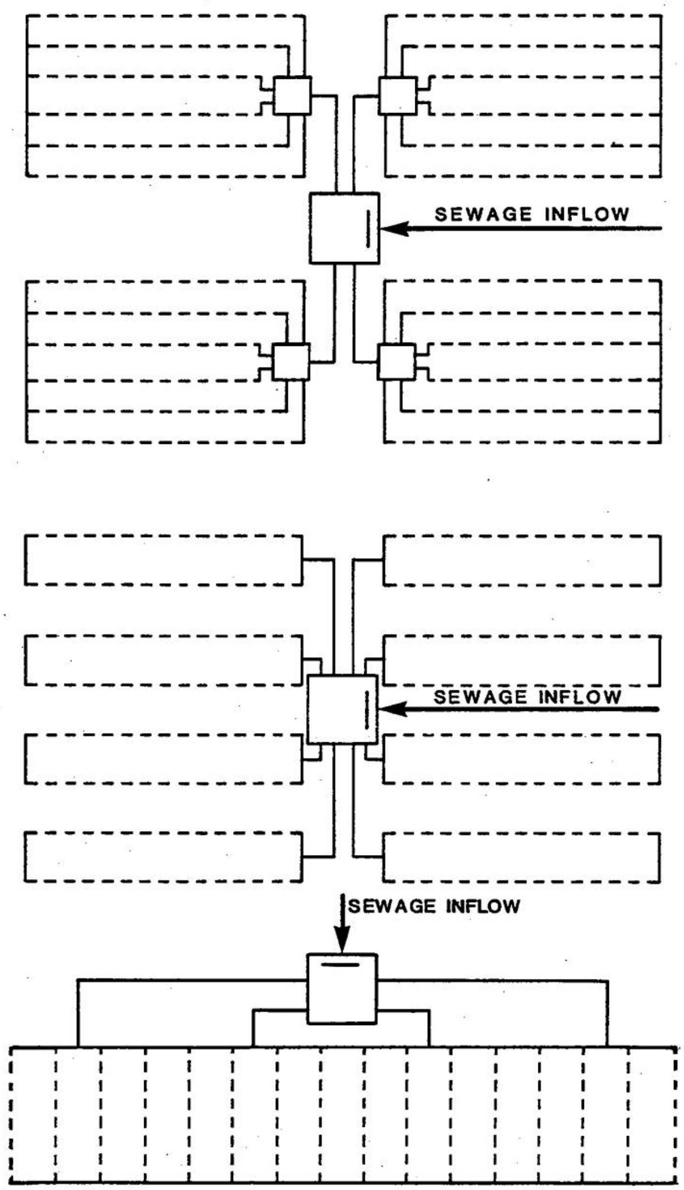
half of the leaching bed so that in total 96 lines would be available for the sewage system. At a maximum length of 30 metres each, this represents 2880 metres. Drawing 8.4.2 illustrates this layout. Accepting this length as feasible assumes good construction practices. Without careful construction considerably smaller leaching beds can give problems in operation. Although, due to the other influencing factors, it cannot be demonstrated that a leaching bed of this size will not have problems, or that a somewhat larger bed will not be acceptable, this size is recommended as a maximum for a single sewage system. In any event, the hydraulic capacity of the site will normally control the maximum daily sewage flow, and leaching beds of this size will only be attained on a very good site.

(c) Hydraulic capacity - This assessment will normally require the services of a consultant and will be undertaken as required to determine the maximum liquid volume that can be absorbed by the soils on a daily basis without breakout to the surface in or near the leaching bed. A similar type of study may be needed to assess the number of separate sewage systems that can be accommodated in a given area. As outlined in Article 1 section 3, mounding of sewage effluent below the bed will occur above the existing ground water table, or above a resistive soil strata or rock, the mound increasing in height until sufficient head has been established to force lateral movement through the soil. Breakout occurs when this mounding rises to the surface. The ability of a site to accept a volume of sewage on a continuing basis is determined by computing the height to which this mound will rise and the extent of the mounding. This information is used to determine if the leaching bed can be located in-ground without the mound rising to a point where it interferes with the operation of the absorption trenches, or if breakout down-slope will occur. It will also indicate if raising the leaching bed would be a solution. It is not a simple problem and a paper outlining a method of determining mounding is attached as Appendix 8.4.2.

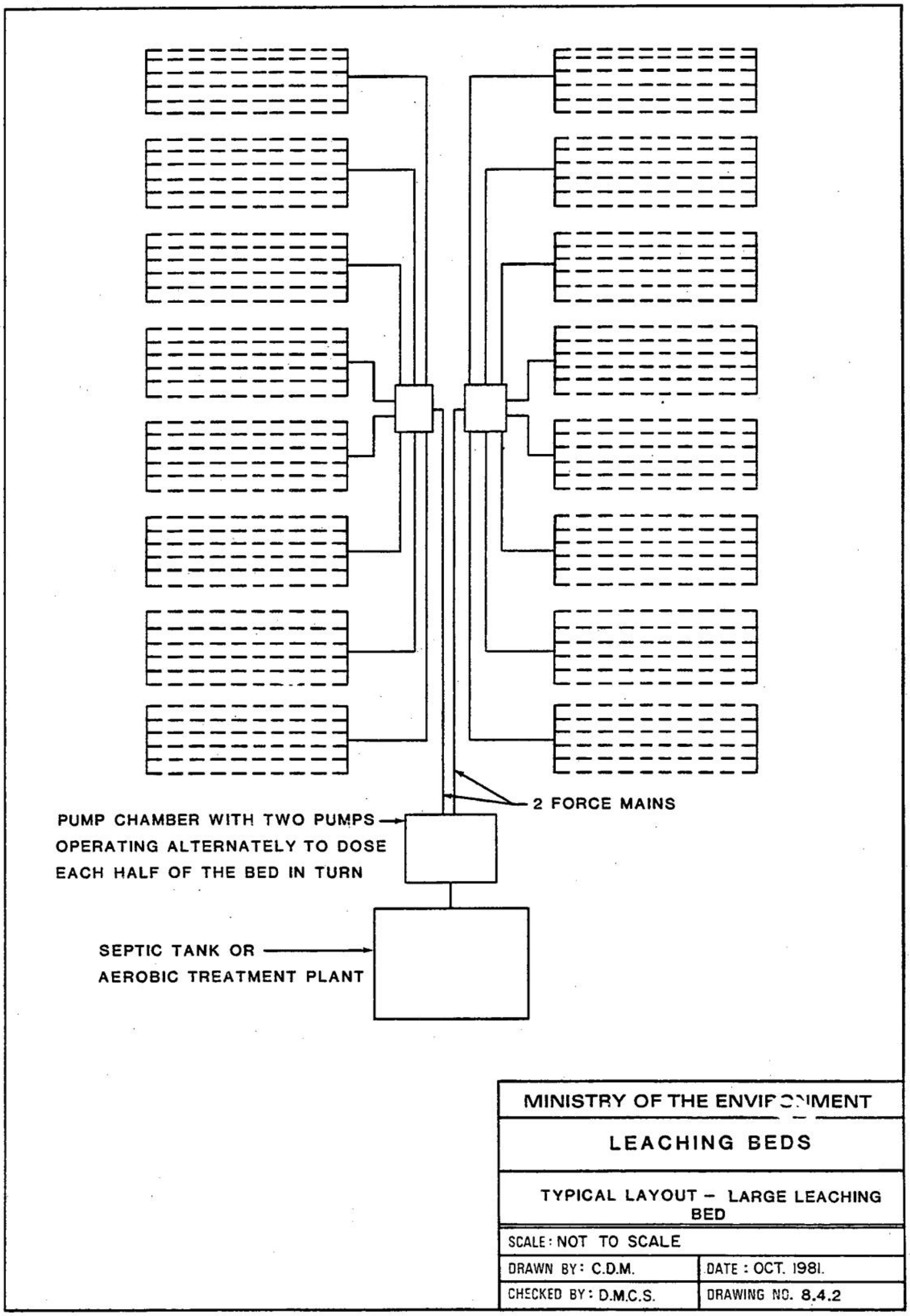
(d) Contamination of an aquifer - One definition of an aquifer describes it as "a water saturated geologic unit that will yield water to wells at a sufficient rate so that the well can serve as a practical source of water". The geological unit could be a saturated soil zone, or rock formation, in which the soil holds the ground water in its pores, or the rock in its cracks and fissures, in much the same way as a sponge. The soil pores, or rock fissures, also permit lateral movement of the ground water under the influence of the hydraulic gradient, and at a rate related to the characteristics of the soil or rock. Two principal concerns respecting the contamination of an aquifer by leaching bed effluent are:

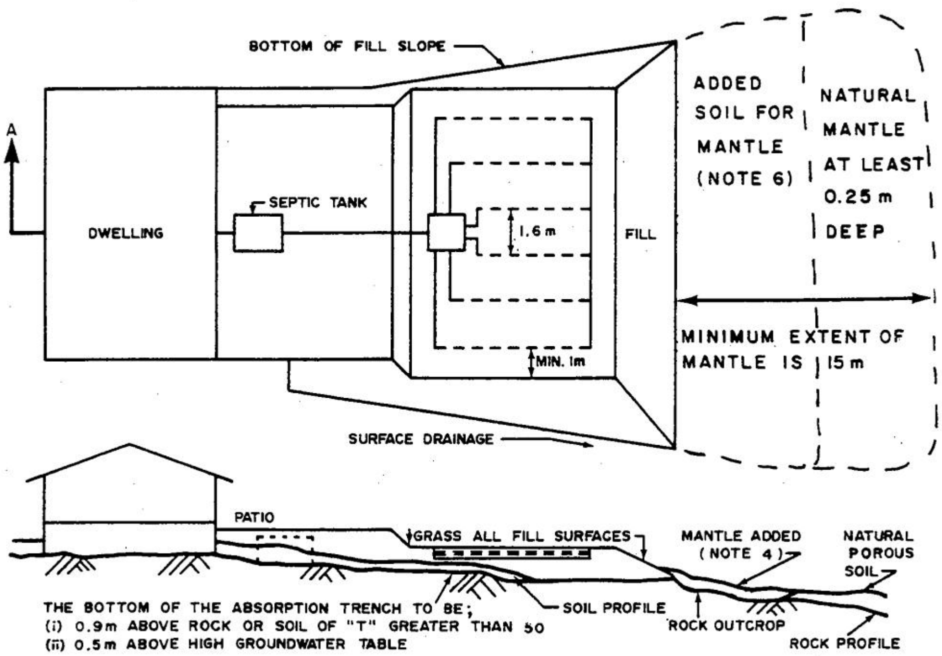
(i) Pathogenic bacteria - The Regulation prohibits the location of a leaching bed where the effluent from the leaching bed would cause impairment of the ground water. It also establishes minimum clearances between the parts of a sewage system and wells, springs, rivers, streams, lakes, ponds or reservoirs. If the regulation is followed these waters should be adequately protected against contamination by pathogenic bacteria.

(ii) Nitrates - The possibility of impairment of ground water supplies by nitrates originating in sewage system effluents is of concern. Whether or not an unacceptable level of nitrate concentration (above 10 mg/L) could be accumulated in downstream wells is determined by an assessment of the quantity of nitrogen in the sewage in relation to the ground water volume and movement, and therefore the dilution 0f this concentration in the aquifer. It can be assumed that, in the worst case, all nitrogen is converted to nitrates. The study is normally carried out by a hydrogeologist.



MINISTRY OF THE ENVIRONMENT	
LEACHING BEDS	
SOME ALTERNATIVE LAYOUTS MEDIUM SIZE BEDS	
SCALE : NOT TO SCALE	
DRAWN BY : C.D.M.	DATE : OCT. 1981
CHECKED BY : D.M.C.S	DRAWING NO. 8-4-1


2 FORCE MAINS
PUMP CHAMBER WITH TWO PUMPS OPERATING ALTERNATELY TO DOSE EACH HALF OF THE BED IN TURN
SEPTIC TANK OR AEROBIC TREATMENT PLANT
MINISTRY OF THE ENVIRONMENT
LEACHING BEDS
TYPICAL LAYOUT – LARGE LEACHING BED
SCALE: NOT TO SCALE
DRAWN BY: C.D.M.
DATE: OCT. 1981.
CHECKED BY: D.M.C.S.
DRAWING NO. 8.4.2

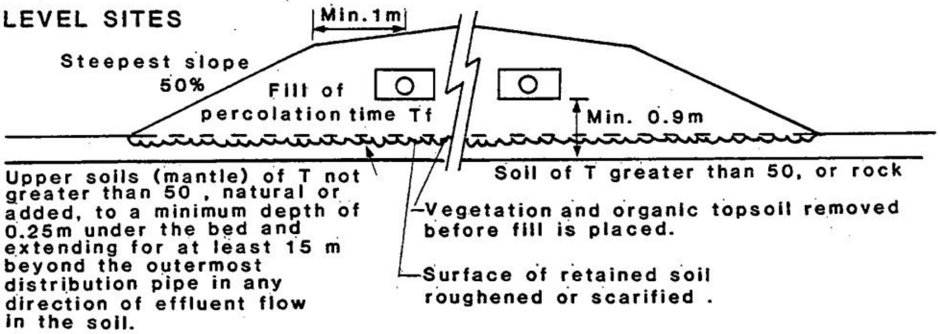


Plan and Profile - Typical Raised Bed

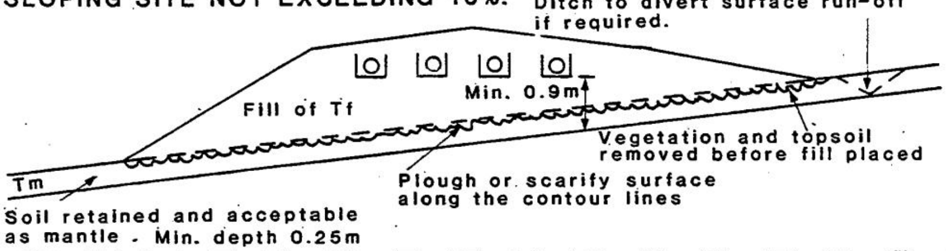
1. CLEARANCES FROM BUILDINGS, LOT LINES, WELLS, ETC., AS FOR NORMAL LEACHING BEDS PLUS 2 METRES HORIZONTAL FOR EACH 1 METRE VERTICAL THAT SURFACE OF BED IS ABOVE GRADE.
2. FILL SLOPE MUST BE STABLE FOR THE MATERIAL USED, BUT NOT STEEPER THAN 2 METRES HORIZONTAL TO 1 METRE VERTICAL.
3. PERCOLATION RATE "T" OF IMPORTED MATERIAL SHOULD PREFERABLY BE NOT LESS THAN 2 MIN/CM.
4. EFFLUENT PASSING THROUGH FILL MUST BE ABSORBED INTO NATURAL SOIL BENEATH THE FILL OR INTO THE SURROUNDING PERMEABLE SOIL WITHOUT PONDING OR BREAKOUT TO SURFACE. THE RELATIONSHIP BETWEEN THE PERCOLATION TIME OF THE FILL FORMING THE LEACHING BED AND THAT OF THE SOIL ON WHICH IT IS PLACED, AND THE REQUIREMENTS FOR A MINIMUM SOIL MANTLE FOR 15 METRES BEYOND THE OUTER PIPES IN ANY DIRECTION IN WHICH THE EFFLUENT FROM THE LEACHING BED MAY MOVE IN THE SOIL, ARE CONTAINED IN THE REGULATION AND ILLUSTRATED IN APPENDIX 8.4.1.
5. DETAILS OF ABSORPTION TRENCH CONSTRUCTION SAME AS IN DRAWING NO. 8.1.1.
6. WHERE SOIL MANTLE (NOTE 4) IS ABSENT, OR OF INADEQUATE DEPTH, SOIL MUST BE ADDED TO MEET THE REQUIREMENTS OF THE REGULATION. THIS MAY BE ADDED OVER AN AREA OR, WHERE THE TOPOGRAPHY IS UNEVEN, ONLY OVER THE ROUTES IN WHICH IT IS OBVIOUS THAT THE IN-GROUND MOVEMENT WILL TAKE PLACE.

MINISTRY OF THE ENVIRONMENT	
LEACHING BEDS	
TYPICAL LAYOUT — RAISED LEACHING BED	
SCALE: NOT TO SCALE	
DRAWN BY: C.D.M.	DATE: OCT. 1981.
CHECKED BY: D.M.C.S.	DRAWING NO. 8.4.3

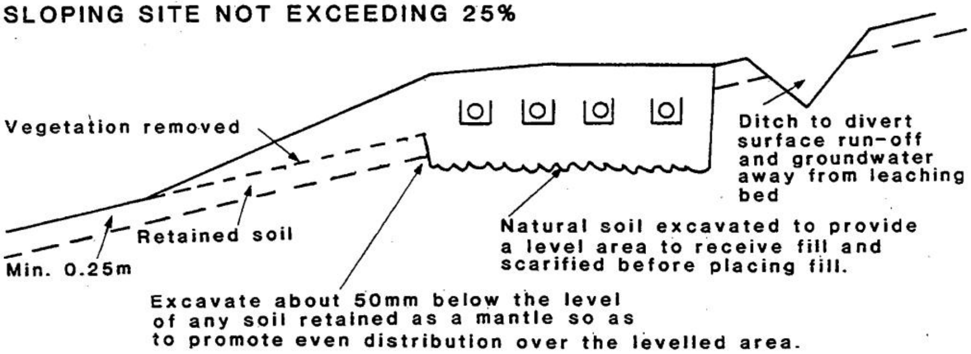
LEVEL SITES



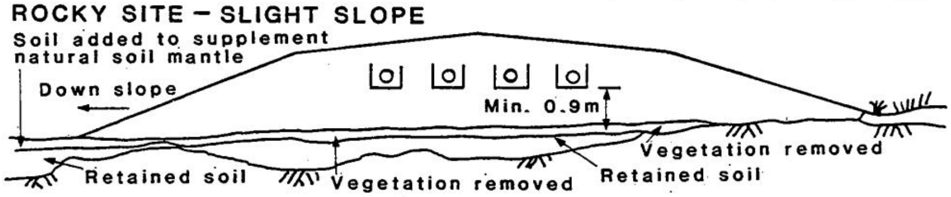
SLOPING SITE NOT EXCEEDING 10%.



SLOPING SITE NOT EXCEEDING 25%



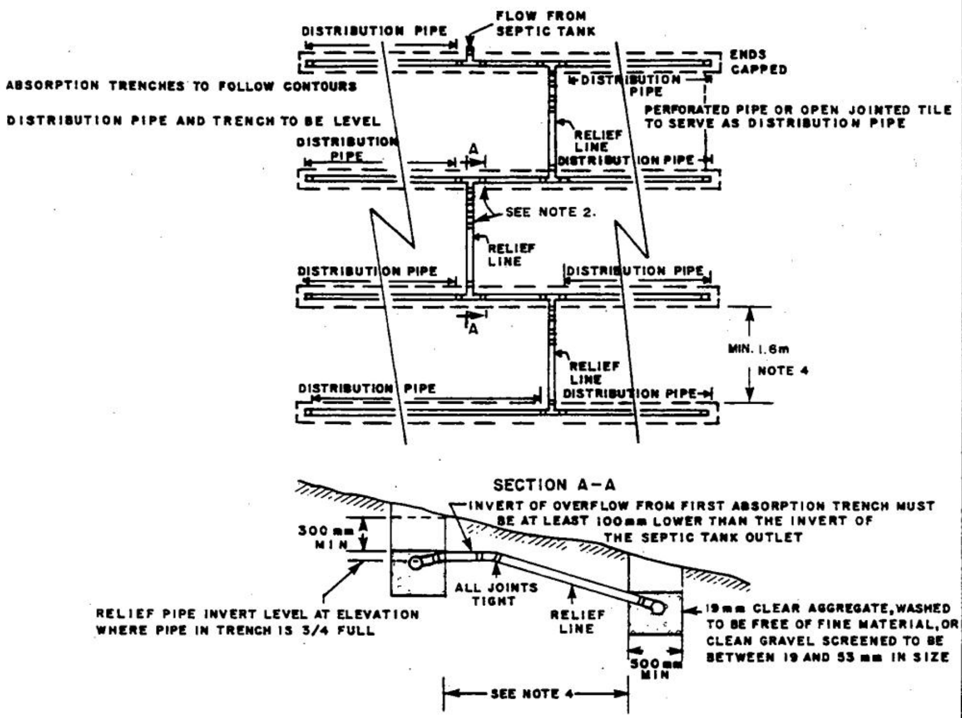
ROCKY SITE – SLIGHT SLOPE



NOTES:

1. If natural soil mantle has a percolation time Tm of greater than 15 but not greater than 50 then :
(I) Fill material percolation time Tf must not be less than 75% Tm or
(II) Material of Tf must be added as mantle of at least 0.25m above natural soil in addition to forming the leaching bed .
2. If Tm is not greater than 15 for 0.25m of depth there is no restriction on fill material if it is not less than Tf = 1. Fill material of T not less than 2 is recommended .

MINISTRY OF THE ENVIRONMENT	
LEACHING BEDS	
PLACING OF FILL ON LEVEL AND SLOPING SITES	
SCALE NOT TO SCALE	
DRAWN BY J.M.	DATE NOV 1981
CHECKED BY R.A.W.	DRAWING NO. 8.4.4.



NOTES:

1 Relief lines to be spaced far enough apart to prevent short circuit (1.5–2.5m is recommended).

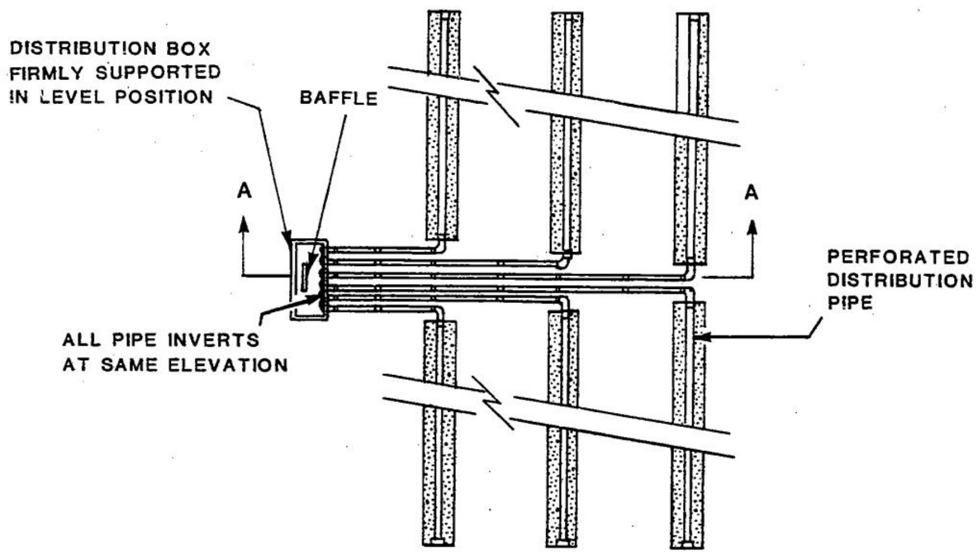
2 Relief lines, and pipe in trenches between relief lines, to be solid walled pipe.

3 Pipe fittings for relief lines to be selected to suit slope.

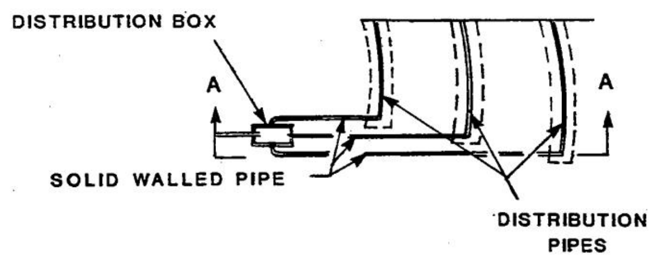
4 A minimum of 1.6m (horizontal) of undisturbed earth is recommended between absorption trenches.

5 Distribution pipe in absorption trenches to extend an equal distance (approximately) in both directions from the interconnecting and relief pipes.
Distribution pipes and trenches to be level and normally follow contour of slope.

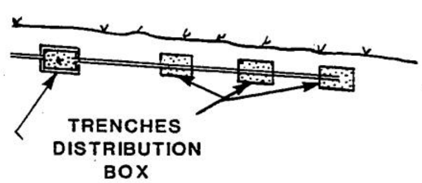
MINISTRY OF THE ENVIRONMENT	
LEACHING BEDS	
SERIAL DISTRIBUTION OPTION FOR SLOPED SITES	
SCALE : Not to Scale	
DRAWN BY : L.L.B.	DATE : AUG. 1981
CHECKED BY : J. Mc.	DRAWING NO. : 8.4.5



CENTRAL FEED



END FEED



SECTION A–A

MINISTRY OF THE ENVIRONMENT	
LEACHING BEDS	
DISTRIBUTION BOX OPTION FOR SLOPED SITES	
SCALE : NOT TO SCALE	
DRAWN BY : L.L.B.	DATE : DEC. 1981
CHECKED BY : D.S.	DRAWING NO. 8. 4. 6.

LEACHING BEDS - SCHEMATIC DRAWINGS
SHOWING THE APPLICATION OF THE REGULATORY
STANDARDS FOR IN-GROUND AND RAISED BEDS

LEGEND

s———s - Natural ground surface

T 50 - Upper surface of soil of T greater than 50

- Rock surface

- High ground water table for design

- Absorption trench bottom - filter medium top

- Soil mantle added in any direction of effluent flow in the soil
Drawings show only one direction

Percolation Times

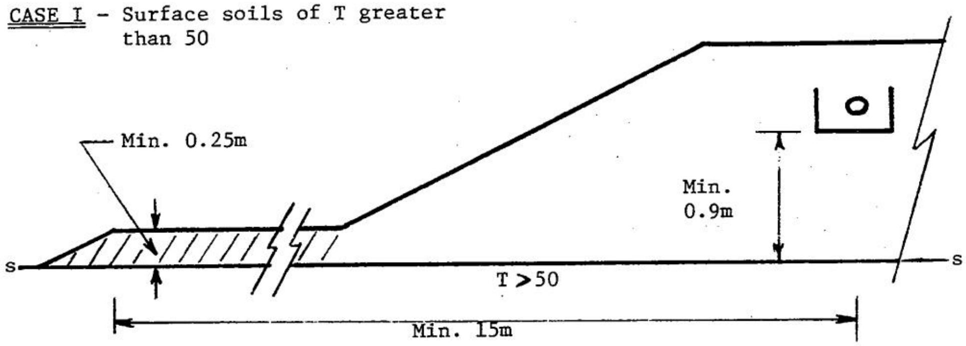
T_M - of 0.25 m mantle

T_U - of soil below fill

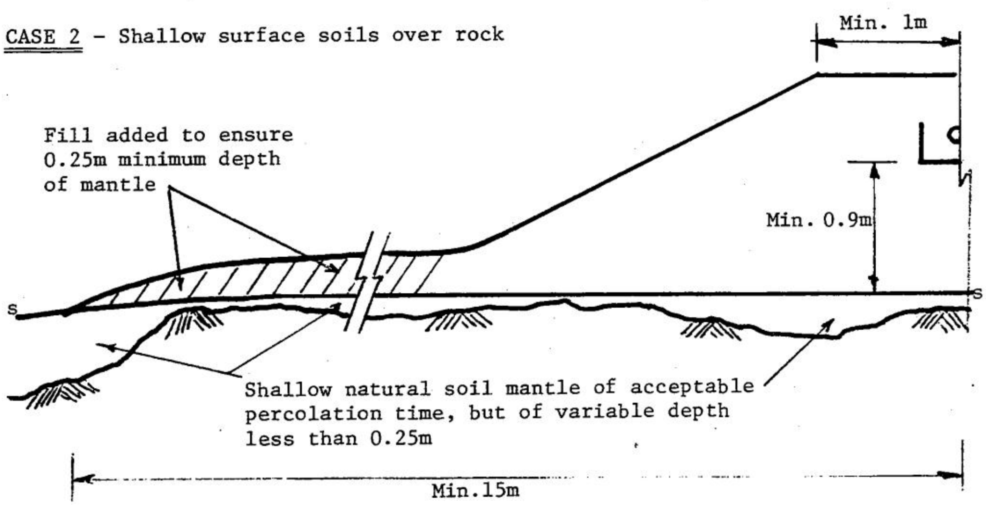
T_F - of fill

T_D - for calculation of distribution pipe

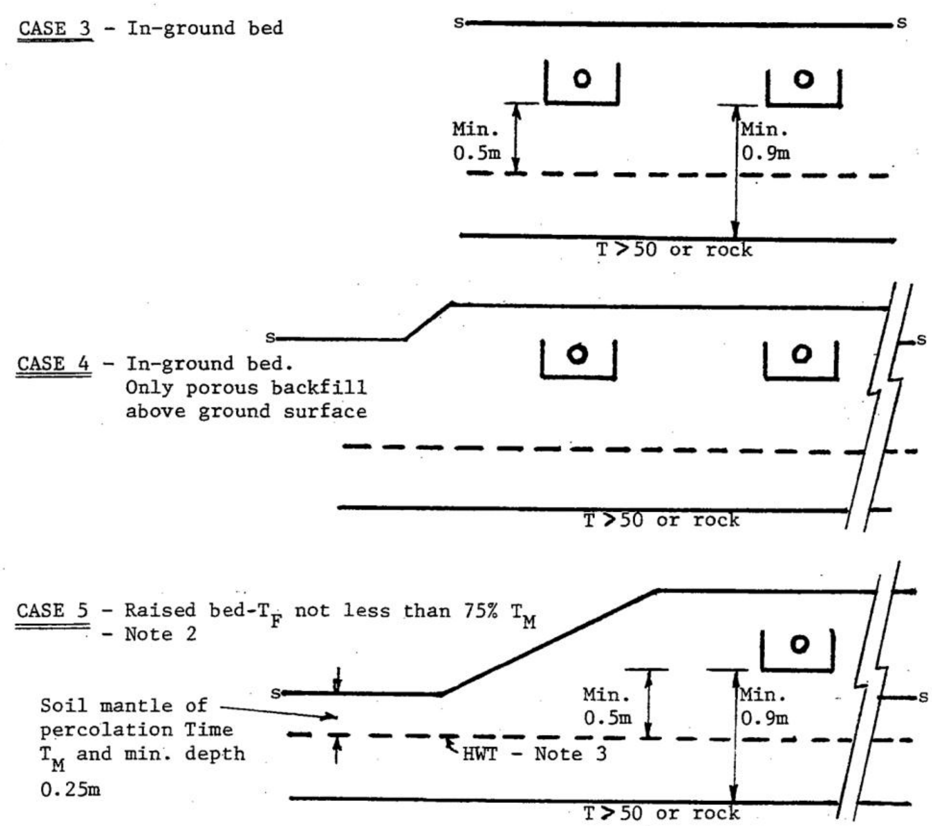
CASE I - Surface soils of T greater than 50



CASE 2 - Shallow surface soils over rock



SURFACE SOILS OF T NOT GREATER THAN 50 BUT GREATER THAN 15

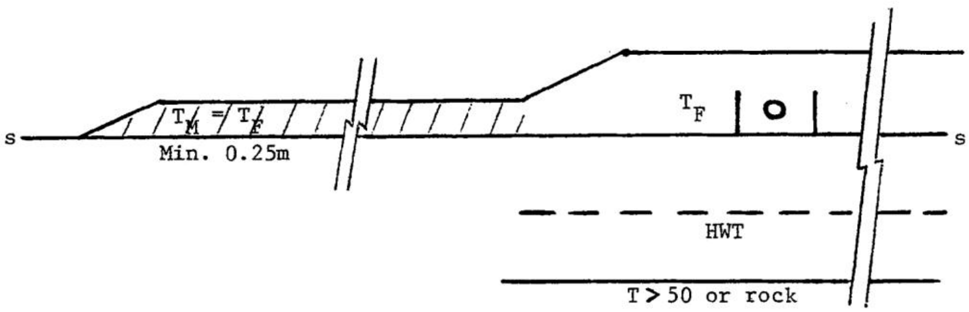


Note 1. If T_F is not less than 75% T_M. no added mantle is required.

Note 2. The rule that T_F must be not less than 75% of T_M would permit a leaching bed to be made in a fine grained soil. For example, an imported fill of T_F = 30 placed on a 0.25m mantle of soil of T_M = 40. However, the importation of fine grained soils is not practical as they are difficult to excavate, place and compact without adversely changing their characteristics (e.g. percolation time). From a practical point of view, the upper limit of percolation time of soils for use in filled leaching beds is about 15 min/ cm. Thus, if the upper 0.25m of soil forming the mantle has a percolation time in excess of about 20 min/cm, it will be normal to import sufficient fill to construct both the mantle and the leaching bed (see case 6).

Note 3. 0.25m of natural soil mantle is shown as being as above HWT. The regulation may accept higher HWT as long as the trench bottom is raised accordingly and mantle is unsaturated when fill is placed. This is only acceptable for short duration as the intent is that the 0.25m mantle be normally above the saturated zone.

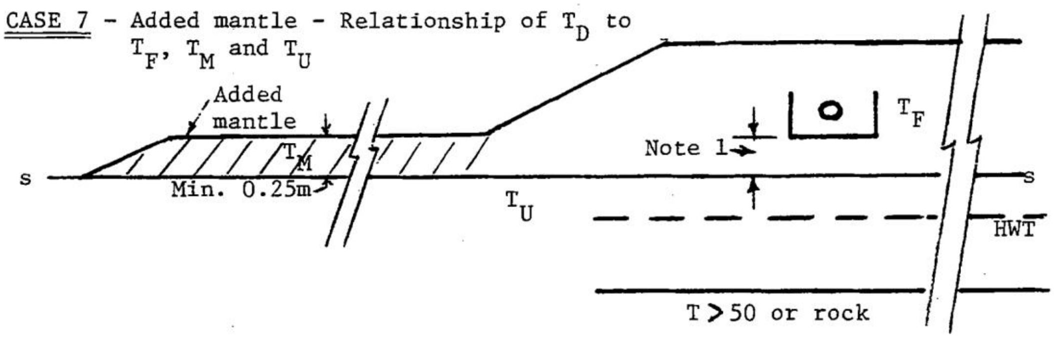
CASE 6 - Added soil mantle required as T_F of available fill is less than 75% of T_U of surface soil.



Note 1. Assume source of fill is a pit of material having $T_F < 75\%\ T_U$ Therefore added mantle is required.

Note 2. The bottom of the absorption trench is shown resting on the natural soil surface. In this case, TD would be the percolation time of the natural soil. If the bed were to be raised to increase the separation between the absorption trench and the natural soil, T_D would be a compromise between T_F and T_u. If it is raised so as to provide an adequate separation (say at least 0.3m) then T_F could be used as T_D.

CASE 7 - Added mantle - Relationship of T_D to T_F, T_M and T_U

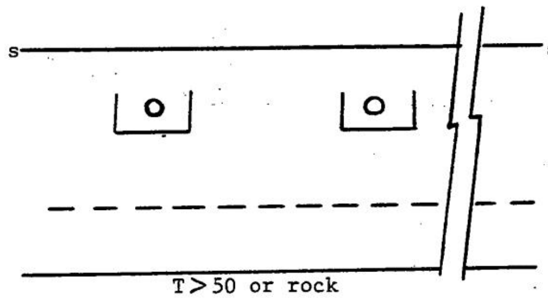


Note 1. Amount of separation between trench bottom and natural soil of T_U in order to safely use T_F as T_D is debatable but minimum separation of 0.3 m is recommended as in Note 2 -Case 6 above.

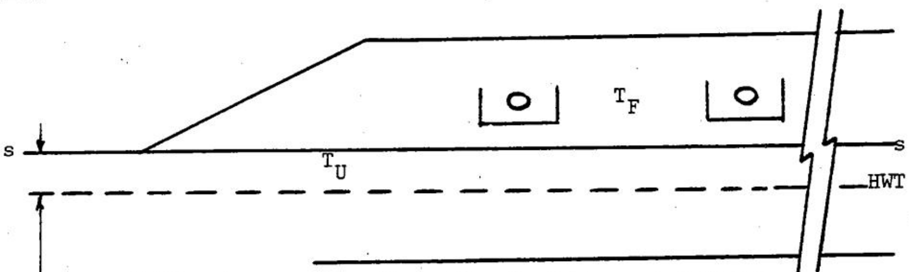
Note 2. The soil used for construction of the leaching bed could be different from the soil used to construct the mantle and both could be different from the natural soil. However, it would be unusual to import two different soils. If they differ, then T_F (leaching bed) may not be less than T_M (mantle). Also the selection of T_D will depend on the location of the bottom of the absorption trenches in relation to the soil types T_F, T_M and T_U.

SURFACE SOILS OF T NOT GREATER THAN 15

CASE 8 - In-ground

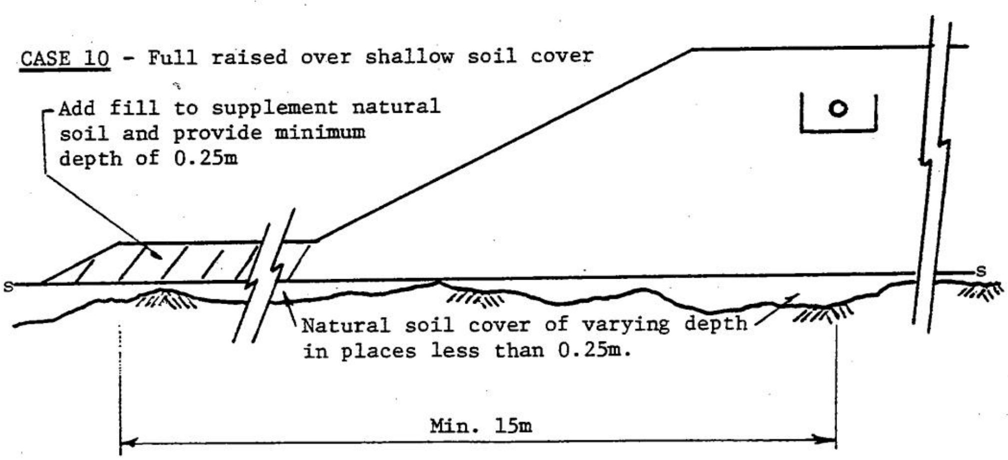


CASE 9 - Partly raised



Upper 0.25m of natural soil mantle should be unsaturated at HWT. No added mantle required. T_F may be less than 75% T_U. T_D is a judgement based on the amount (depth) of soil of T_F vs. the depth of soil T_U under the trenches.

CASE 10 - Full raised over shallow soil cover



FILTER TYPE LEACHING BEDS

1 INTRODUCTION

(a) As distinct from an absorption trench leaching bed in which each line of distribution pipe is in a separate trench, a leaching bed in which the sewage enters a system of distribution pipes, all set in a common layer of stone covering the surface to which the sewage is applied, is referred to by some agencies as a "seepage" or "area" bed. The only leaching bed of this type for which standards are included in the Regulation is one in which the soil to which the sewage is applied is specified as to particle size and depth. It is called a filter bed. A typical filter bed is illustrated in Dwg. 8.5.1.

(b) The specified filter medium must be used in the construction of filter bed. As fines are virtually excluded, natural sand deposits will rarely meet the specifications of the filter material and it will normally be purchased from sand and gravel suppliers.

2 DESIGN OF FILTER BEDS

The basic requirements for filter beds are set down in the Regulation. Articles 1, 2 and 3 of this Chapter are also applicable. Some of these requirements are:

(a) The filter medium - An approved sand is one as shown in Appendix 8.5.1 in which the soil particles fall within the limits of,

(i) an effective size of 0.25 millimetres with a uniformity coefficient net less than 3.5, and,

(ii) an effective size of 2.5 millimetres with a uniformity coefficient not greater than 1.5.

(b) The minimum depth of filter medium is 0.75 metres.

(c) The stone layer in which the distribution pipe is set is continuous over the surface of the filter medium, and is comprised of stone which is either 19 millimetre clear aggregate, washed to be free of fine material, or clean gravel screened to be between 19 and 53 millimetres in size.

(d) The lines of distribution pipe are evenly spaced over the surface of the filter medium at a spacing not exceeding 1.2 metres.

(e) The stone layer in which the distribution pipe is set extends at least 0.15 metres beyond the ends of any distribution pipe and at least one half of the distribution pipe spacing beyond the centre line of the outer most line of pipe.

(f) The surface of the filter medium to which the sewage is applied shall be at least 0.9 metres above rock or a soil of percolation time greater than 50 mins/cm, and at least 0.5 metres above high ground water table.

(g) A leaching bed may be constructed of imported soil only where there is at least 0.25 metres of soil mantle of T not greater than 50 mins/cm, existing or added, over the area covered by the bed and extending for at least 15 metres beyond the outer distribution pipe in any direction in which the effluent from the bed will move laterally. The regulation also requires that, if the soil forming the mantle has a percolation time greater than 15 mm/cm, the percolation time of any soil added to it in order to construct the leaching bed (i.e. in this case the filter medium) shall not be less than 75% of that of the mantle. The effect of this rule is that the soil forming the mantle for a filter bed cannot have a percolation rate greater than 15 mm/cm. It must be imported to meet the requirements of the mantle in any case where a filter bed is to be constructed in or on a soil of T greater than 15 min/cm.

(h) The base of the filter medium shall be extended horizontally at a minimum thickness of 0.25 metres to cover an area meeting the requirements of the formula A = QT/850, where A is the area of contact in square metres between the filter medium and the underlying soil, Q is the daily sewage flow in litres, and I is the percolation time of the

underlying soil in mins/cm. A filter can be located in-ground providing the T of the soil in which it is located is not greater than 50 mins/cm, but it can be seen that the requirements of contact area would mean a very extensive excavation to provide for the expanded base if it is located in soils of T in the higher values of the acceptable range. This, combined with the requirements of soil mantle, will mean that filters are frequently raised or partly raised, and will always be at least partly raised if constructed in or on an existing soil having a T exceeding 15, as illustrated in Appendix 8.5.2.

(i) Even distribution of the treated sewage over an area derived from the formula A = QT/850 represents a loading on the soil of about 5.9% of the clear water absorption as expressed by the percolation time. For example a soil of T of 50 mins/cm underlying a filter medium can theoretically absorb 288 litres of clear water in a 24 hour period over an area of 1 square metre. From a rearrangement of the formula A = QT/850 it can be determined that where A is 1 square metre and T is 50, Q will be 17 litres which is 5.9% of the theoretical clear water loading of 288 L/m^3.

3 USE OF FILTER BEDS

There are both advantages and disadvantages to the use of filter beds as opposed to beds of the absorption trench type, and proper recognition of these factors, and the limitations on the use of such beds, is important.

(a) Advantages of filter beds are;

(i) they occupy less space than an absorption trench bed in a similar situation, and may allow construction on lots where there is insufficient space for an absorption trench bed, providing the sub-surface conditions are adequate for absorption of the effluent from the bed,

(ii) trees can be saved due to the reduced area occupied,

(iii) providing the filter medium is available at reasonable cost, their use may be more economical as opposed to a raised absorption trench bed, where the greater amount of site preparation, volume of fill, and quantity of distribution pipe, may result in high costs for an absorption trench bed.

(b) Some disadvantages of filter beds are;

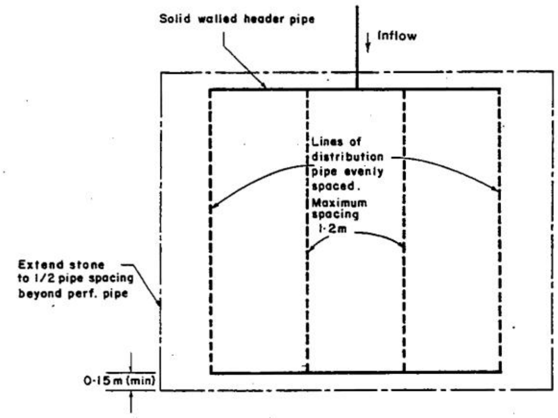
(i) the availability of the specified medium may lead to high costs if considerable haul distance is involved,

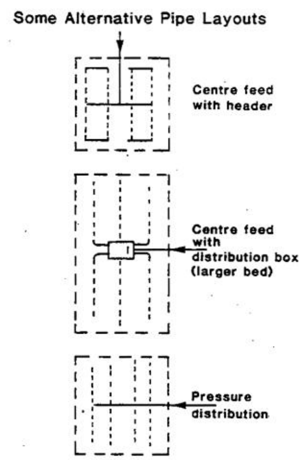
(ii) the smaller area covered by a filter bed concentrates the same volume of liquid in a much smaller area than would be the case if an absorption trench bed were used. This increases the problem of absorption of the bed effluent by the underlying and surrounding soils if breakout is to be avoided.

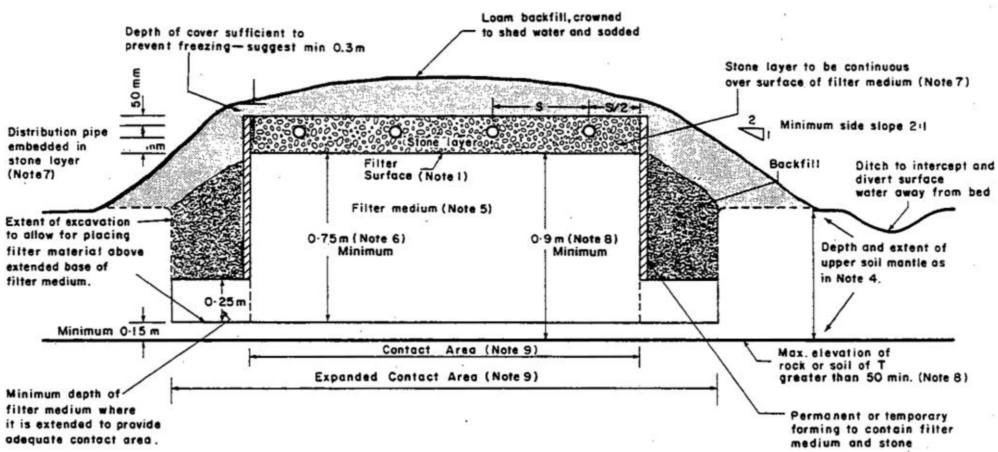
4 SIZE LIMITATIONS

It is important that the sewage is distributed evenly over the surface of the filtering medium as the size of the filter is determined from the daily sewage flow and the permissible loading rate for the quality of sewage applied. Although the area of the filter surface increases directly with increased sewage flow, the perimeter of the filter does not. The likelihood of achieving even distribution is reduced, and the problem of ensuring absorption in the underlying and surrounding soils is increased. For these reasons the regulation imposes a maximum size of 50 square metres on a filter, sets a maximum daily sewage flow for a sewage system using a filter type leaching bed, and requires a reduction in the unit loading for filters once the daily sewage flow exceeds an amount stated, for each type of sewage system.

TYPICAL SAND FILTER
(Adaptable for use with both class IV or class VI sewage system)







NOTES

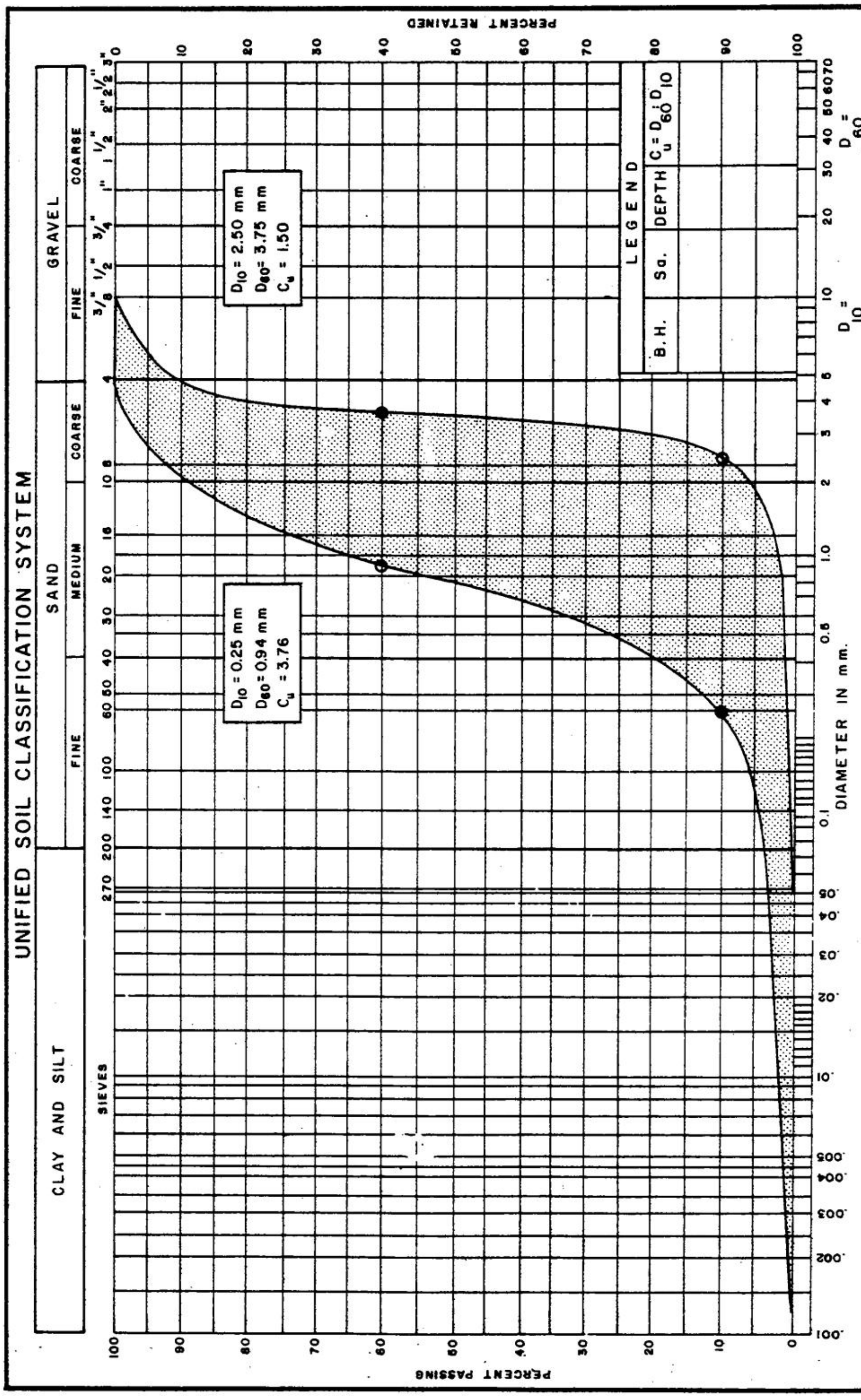
Refer to O. Reg 374/81 (Sec 10 and Sec 12) for regulations governing sand filter type Leaching beds.

1. Maximum area of filter surface 50 m^2.
2. Permissible loading on filters :

Class IV sewage systems	75 L/m^2/day for flows up to 3000 L/day.
	50 L/m^2/day for flows between 3000 L/day – 5000 L/day.
Class VI sewage systems	150 L/m^2/day for flows up to 6000 L/day.
	100 L/m^2 day for flows between 6000 L/day and 10,000 L/day.

3. The maximum daily sewage flow of a sewage system in which the leaching bed may be of the filter type is 5,000L for a class 4 sewage system and 10,000L for a class 6 sewage system. At maximum size in each case two 50 m^2 filters are required.
4. A soil mantle of T not greater than 15 min./cm and at least 0.25m in depth is required to extend at least 15m beyond the outer distribution pipes in any direction in which the effluent from the bed will move laterally. It must be added if the soil in or on which the filter bed is to be constructed has a T value exceeding 15min/cm.
5. Only filter material meeting grading requirements acceptable to the Ministry of the Environment may be used.
6. Minimum depth of specified filter material 0.75m.
7. Pipe to be bedded in stone that is either 19 mm clear aggregate washed to be free of fine material, or clean gravel screened to be between 19 and [illegible] in size.
8. Surface of sand filter material to which sewage is applied must be a minimum of 0·9m above rock or soil of T greater than 50 minutes/cm and at least 0·5m above the high groundwater table.
9. Contact area between the filter medium and the underlying soil must not be less than the area A = QT/850 where Q is the daily sewage flow in litres and T is the percolation time of the underlying soil.

MINISTRY OF THE ENVIRONMENT	
LEACHING BEDS	
TYPICAL SAND FILTER	
SCALE : NOT TO SCALE	
DRAWN BY : L.L.B.	DATE : APRIL 1982
CHECKED BY : D.S.	DRAWING No : 8. 5. 1.

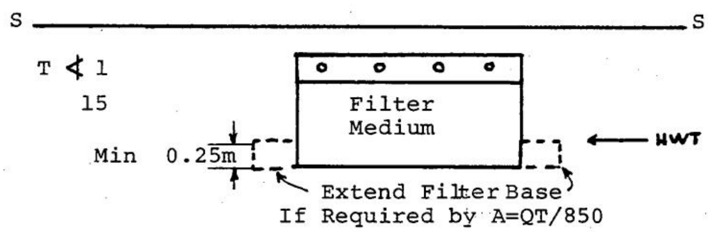


GRADING LIMITS FOR SAND FILTER MATERIAL.

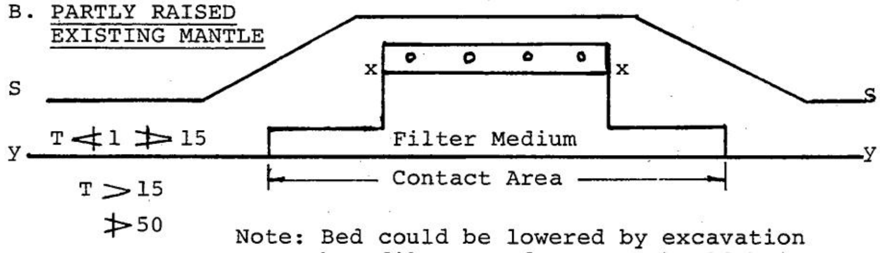
FILTER BED INSTALLATION UNDER VARIOUS ON-SITE SOIL CONDITIONS

Note: Ground surface = S——S

A. IN GROUND

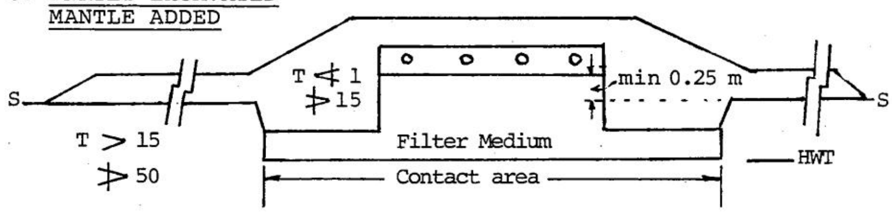


B. PARTLY RAISED EXISTING MANTLE

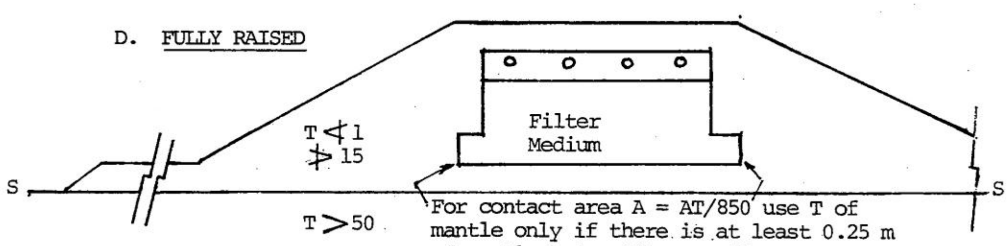


Note: Bed could be lowered by excavation but filter surface x-x should be at least 0.25 m above line y-y

C. PARTLY EXCAVATED MANTLE ADDED



D. FULLY RAISED



9

CHAPTER 9

CLASS 4 (SEPTIC TANK) SEWAGE SYSTEM

CHAPTER 9

CLASS 4 (SEPTIC TANK) SEWAGE SYSTEMS

CLASS 4 SEWAGE SYSTEMS

GENERAL

1 DESCRIPTION

A Class 4 Sewage system is a septic tank system and consists of a septic tank connected to a building sewer, a leaching bed and the piping, pumps and other appurtenances which transport the tank effluent to the leaching bed. Drawing 9.1.1 illustrates a typical small septic tank system. In some larger systems the sewage may be delivered to the tank by a sewer to which two or more building sewers are connected. The principal components, and the action that takes place in these components, are:

(a) The septic tank which receives sewage from the building sewer, and in which solids are settled to improve the quality of the sewage prior to its movement to the leaching bed. Anaerobic bacterial action breaks down much of the solid matter to liquids and gases. The tank design allows for the storage of the solid matter which rises to the surface to form a scum and that which settles to the bottom to form sludge. If the accumulation of sludge and scum is kept within limits by periodic cleaning, the tank should provide reliable service.

(b) The leaching bed receives the liquid effluent from the tank. This sewage still contains solids and is highly charged with bacteria and nutrients. The sewage is distributed in the leaching bed by means of distribution pipes set in a stone layer located in the absorption trenches or above a filter medium. The sewage percolates downwards through the soil where it receives treatment due to the action of aerobic bacteria in the pores of the soil. The key to the design of an efficient leaching bed is the assessment of the soil and of the highest level of the water table in the area of the proposed bed. The contents of Chapter 8 are applicable to all leaching beds used in Class 4 sewage systems.

2 APPROVAL

(a) Section 64 of the EP Act states that a Certificate of Approval is required for the construction, installation, establishment, enlargement, extension or alteration of a Class 4 sewage system. An Application for a Certificate of Approval is submitted in accordance with Chapter 3, Article 3.

(b) Section 67 requires that a Use Permit be issued before a Class 4 sewage system is used or operated. Use Permits are dealt with in Chapter 3, Article 4.

3 POLICY

(a) Policy respecting the construction, operation and maintenance of Class 4 sewage systems and their location with respect to property is contained in the regulation and the detail should be read there in general terms it,

(i) requires that the construction, operation and maintenance of Class 4 sewage systems complies with the regulatory standards unless otherwise provided in a certificate of approval, permit or order,

(ii) prohibits the discharge of sewage or effluent onto the surface of the ground or into surface waters,

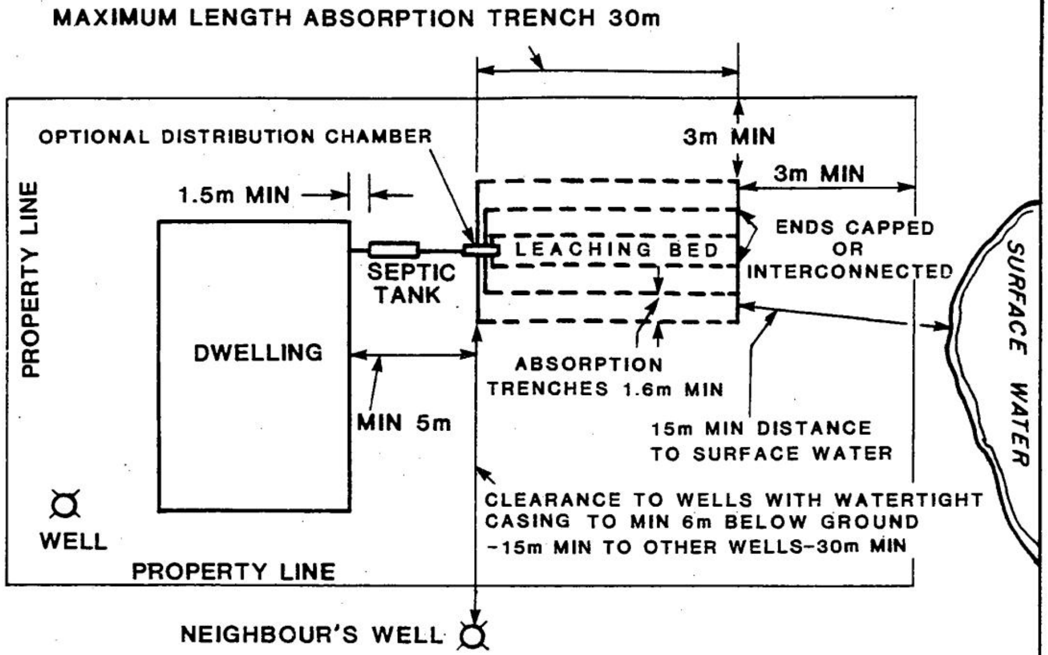
(iii) prohibits animal or insect access to the sewage in the system,

(iv) prohibits the emition or leaking of sewage or effluent or gas from a system other than from where so intended in the design,

(v) prohibits the making of connections to the system from non-wastewater sources,

(vi) requires reporting by the owner to the authorities of any malfunction that cannot be corrected by the owner or the correction of which requires a Certificate of Approval,

(vii) requires the owner to obtain an easement respecting any part of the sewage system not contained on the lot or parcel of land on which the building served by the sewage system is located.



TYPICAL ARRANGEMENT OF A SEPTIC TANK SYSTEM

NOTES:

1. The above layout is suitable for a leaching bed using normal construction methods.
2. Location of tank and leaching bed to be on lower ground than adjacent wells or springs, if possible.
3. Internal plumbing and main drainage outlet should be designed with a view to connecting to possible future sanitary sewers.
4. Roof water, surface water, discharge from footing drains, etc. must be excluded from entry to septic tank.
5. Leaching beds NOT to be located in swampy ground or in ground liable to flooding.
6. See the Regulation regarding details for the siting of the septic tank and tile bed.

MINISTRY OF THE ENVIRONMENT	
CLASS 4 SEWAGE SYSTEMS	
TYPICAL SMALL SEPTIC TANK SYSTEM	
SCALE : NOT TO SCALE	
DRAWN BY : L.L.B.	DATE : DEC. 1981
CHECKED BY : D.S.	DRAWING NO. 9.1.1

SEPTIC TANKS

1 The basic function of the septic tank is to receive the sewage, partially treat it, segregate and retain the solids, and discharge the liquid to the leaching bed. Bacterial action breaks down much of the solid matter in the tank to liquids and gases, and, in an efficiently operating septic tank, the liquid discharged from the tank is comparatively clear, although it still retains the fine solids.

2 The effectiveness of a septic tank in the settling of solids depends on:

(a) The velocity of flow in the tank. For a given volume entering the tank the velocity varies inversely with the cross-sectional area of the liquid in the line of its flow through the tank.

(b) The retention time of the liquid within the tank.

(c) The tank design. It has been found from experience that a septic tank of two or more compartments for the settling of sewage achieves better clarity of effluent than a single compartment tank. The regulation requires a minimum of two such compartments, with the second having a working capacity of approximately 50% of that of the first compartment.

(d) The composition of the liquid/solids mixture.

(e) The degree to which the septic tank is already filled with solids.

3 TANKS IN SERIES

Where the size of a septic tank as determined by formula from the daily sewage flow, exceeds that of readily available prefabricated tanks, a proposal may be made to connect a number of prefabricated tanks in series such that their total working capacity is equal to that required for the job. This may be accepted within reason, but it should be remembered that each smaller tank has been proportioned as to length and width to provide for a working capacity that is only part of the total daily sewage flow in the proposed system. Thus the peak daily flows encountered in the system will result in a higher velocity of flow through each of the smaller tanks than would be encountered in a properly proportioned single tank, and this would disturb the solids settling process. It is therefore recommended that no more than two prefabricated

tanks be connected in series. Two tanks in series having a volume ratio of the first to the second tank in the order of two to one would be somewhat similar in operation to a single two compartment tank. Another factor to consider is that each tank will have a minimum drop from inlet to outlet of 50 millimetres. The effect of this on the elevation of the leaching bed may require the use of pumps where otherwise gravity flow may be possible.

4 SEPTIC TANKS IN PARALLEL

On occasion, an applicant proposes the installation of more than one standard sized septic tank in parallel, connected to a common sewer pipe. If the split in flow takes place in the pipe using a “y" it is difficult to ensure that each tank will receive its appropriate share of the sewage. Plugging of the sewer line may result if solids stick across the divider and therefore such installations are not recommended. A means of splitting flow to tanks in parallel is to have the sewer discharge to a pump well from which it can be delivered to more than one septic tank by means of alternating pumps.

5 LOCATION OF A SEPTIC TANK

A septic tank shall not be located closer than 15 metres to a well, lake, river, pond, stream or reservoir, 1.5 metres to a building or structure, or 3 Metres to a property line.

6 TANK DESIGN - GENERAL

The standards for the design and construction of septic tanks are included in the regulation. Construction may be of concrete, steel, fibreglass-reinforced plastic, polyethelene or such other material as may be approved by the Minister. Tanks may be prefabricated and delivered to site for installation or may be constructed on site. In general terms the regulation adopts as a standard the Canadian Standards Association (CSA) Standard CAN3-B66 for "Prefabricated Septic Tanks and Sewage Holding Tanks". In addition to this basic standard, the regulation covers requirements for Ontario respecting tank size and general proportions, the number of compartments, the location of access openings, tank markings and certification. While CSA standard B66 was prepared for prefabricated tanks the regulation embodies this standard for any septic tanks constructed on site. It may also be used as a means of determining the acceptability of any tank which is proposed for use as a septic tank, but which may have been originally constructed for some other purpose.

7 SIZING OF SEPTIC TANKS

(a) Residential sewage systems - septic tanks for residences of up to 5 bedrooms shall have a minimum working capacity in accordance with Table 9.2.1.

TABLE 9.2.1

SMALL RESIDENTIAL SEPTIC TANKS

No. of Bedrooms (allows 2 persons per bedroom) - See Note 1	Minimum total working capacity (litres)*-see Note 2
2	2700
3	3600
4/5	4500

Note 1 - Where the number of occupants is known and exceeds two times the number of bedrooms, the tank size selected should be that which relates to the next higher number of bedrooms.

Note 2 - Exclusive of any pump or siphon chamber.

(b) Tanks other than tanks to which Table 9.2.1 applies -The working capacity of such tanks shall not be less than twice the daily sewage flow for daily sewage flows of 3600 litres or less, and not less than three quarters *of* the daily sewage *flow plus* 4500 litres for daily sewage flows in excess of 3600 litres.

8 GENERAL REQUIREMENTS

These are outlined in the regulation and are primarily in CSA Standard CAN3-B66 as the regulation requires. Inspectors should be familiar with all these requirements, some, but not all of which, are repeated hereunder:

(a) Strength and water tightness - Prefabricated tanks must be able to pass the strength and water tightness tests in GSA Standard CAN3-B66.

(b) Depth of burial - Tanks must be designed to carry a minimum of 600 mm of cover and shall be marked to show the maximum depth of burial.

(c) Liquid depth - The minimum liquid depth shall be 1200 millimetres except that a minimum depth of 900 millimetres may be used where excavation in rock is necessary or to avoid rupture or displacement of the tank due to ground water pressure.

(d) Settling compartments - A minimum of two compartments are required for the settling of sewage, exclusive of any pump or siphon chamber which may be an intregal part of the tank's construction. The working capacity of the second compartment is to be approximately 50% that of the first.

(e) Compartment Partition - A partition separating settling compartments shall extend at least 150 millimetres above the liquid level and have air space between that level and the top of the tank equal to three times the cross-sectional area of the inlet pipe so as to provide for the free flow of air between compartments. This vent could be holes in the partition if the partition is carried to the ceiling as part of its structural support.

(f) Inter compartment flow - This may be through a fixture similar to an outlet device, or through two or more openings through the partition, located in a horizontal line and evenly spaced across the partition, centred at approximately 40% of the liquid depth below the surface of the liquid and having a total area equal to three times that of the cross-sectional area of the inlet pipe.

(g) Scum storage - There must be an air space for scum storage directly above the settling (septic) compartments having a volume of at least 10% of the liquid volume in the compartment. The intercompartment air vents should be above the level occupied by this storage space. CSA Standard CAN3-B66 requires that a partition separating the settling chambers from an integral pump or siphon chamber (not to be confused with the partitions between settling chambers) shall be constructed to a height at least above the scum storage space, and have an air circulation space above that level equal to the cross sectional area of a 4-inch pipe. In the CSA standard this is referred to as the "scum" partation.

(h) Inlet and outlet devices - The inlet to the septic tank, and the outlet from the last settling chamber, may be an open-topped TY fitting, a baffle or an elbow fitting. An elbow may be used as an inlet fixture if it is desired to avoid venting the tank to the plumbing stack of the building served, or if this is not practical. Venting should then be to the leaching bed, in which case an elbow should not be used as the outlet device, or to a separate vent. Requirements are:

(i) an open topped inlet or outlet device shall extend at least 150 millimetres above the surface of the liquid, or above the top of the scum partition if one is used, but there should be a minimum 25 millimetres of unobstructed space above the fitting,

(ii) an inlet device shall extend at least 75 millimetres, but not more than 125 millimetres, into the liquid,

(iii) an outlet device shall extend below the liquid level a distance of not less than 25% nor more than 40% of the liquid depth.

(iv) To minimize the amount of solids leaving the tank, the entrance to the outlet fixture may be protected from the particles rising to the surface with gas bubbles. Some designs locate the outlet fixture in an outward extension of the end wall above the sludge level. In others, a deflector may be built onto the end wall of the tank below the outlet, or be attached to the outlet fixture.

(i) The liquid level in a settling chamber shall be not less than 50 millimetres below the level of the invert of the inlet pipe.

(j) The horizontal travel of the sewage from the vertical centre line of the inlet of that of the outlet shall not be less than 1200 millimetres. If baffles are used the measurement shall be from points midway between the tank wall and the baffle.

(k) Access openings - An opening of minimum dimension of 400 millimetres shall be provided for access to any tank, chamber or compartment below the opening. If located over a dividing partition to provide access to two compartments the minor dimension shall be 600 milli -

metres (300 to each compartment). Openings shall be located to facilitate the pumping of all compartments and the servicing of the inlet and outlet of any compartment not accessible by the removal of the tank top or part thereof any access opening which is exposed should be locked.

(1) Markings - Prefabricated tanks shall bear a permanent marking located on top of the tank near the access opening at the inlet end which provides the following information (which can be symbolized as shown in CSA Standard CAN3-B66):

(i) the manufacturer's name or trademark,

(ii) the year of manufacture,

(iii) the working capacity of each settling chamber,

(iv) the type of tank i.e. trickle-type septic tank or a septic tank with a pump or siphon chamber,

(v) the volume per flush in tanks with a pump or siphon chamber, if authorized to be less than 340 litres at a minimum flush rate of 90 litres per minute,

(vi) the maximum depth of cover for which the tank is designed,

(vii) the liquid depth if less than 1200 millimetres,

(viii) if a concrete tank, whether it is suitable for sulphate or alkaline soils,

(ix) the symbol or logo of the certifying agency if the tank is not of a type which has been accepted as a result of an inspection and testing by a professional engineer in accordance with the regulation,

(x) a statement that the tank meets the requirements of the regulation. This is a Ministry requirement in addition to the requirements of CSA Standard CAN3-B66.

9 SEPTIC TANK PROPORTIONS

The ratio of length, width and depth of a septic tank for a given working capacity should be such as to provide for optimum scum and sludge storage together with good settling characteristics. Should a tank be proportioned too deep, the provision for sludge accumulation may be the same in volume as in a shallower tank, but, for the same tank volume the scum storage would be greatly reduced. For small prefabricated tanks the depth should not appreciably exceed the specified minimum. In larger tanks a maximum depth of 1800 to 2000 millimetres is recommended. A ratio of length to width such that the length is 2 to 3 times the width is recommended for good proportions.

10 CERTIFICATION AND MARKING OF PREFABRICATED SEPTIC TANKS

The regulation requires that the manufacturers, of prefabricated septic tanks;

(a) have their tanks accepted for use in the Province by,

(i) obtaining certification from a qualified certifying agency, such as CSA or the Underwriter's Laboratories of Canada (ULC), that their products are in compliance with the regulation, or,

(ii) arranging for an annual inspection of their plant and the inspection and testing of a representative tank or tanks by a professional engineer whose report is then forwarded to the Private Sewage Unit, Environmental Approvals and Project Engineering Branch. Acceptance of the report by that Branch will have the same effect as the CSA or ULC certification in (i).

(b) ensure that the marking requirements of CSA Standard CAN3-B66 are followed and, in addition, that each tank is marked .as being in compliance with the regulation.

CLASS 4 SEWAGE SYSTEMS

DESIGN

1 GENERAL

A Class 4 sewage system will vary as to size, component parts and layout depending upon such variables as:

(a) the daily sewage flow to be used in design and the pattern of this sewage flow within any one day.

(b) the site conditions including topography, surface and subsurface drainage, soil stratification and characteristics, particularly soil permeability, existing and design water table and the prevalence of rock.

(c) the relative elevation of the components of the sewage system in relation to the building(s) served and to each other.

2 CLASS 4 SEWAGE SYSTEM COMPONENTS

A small gravity flow system may consist only of the septic tank and leaching bed (including distribution pipe and a header or distribution box) and the pipe connecting the two. More complex sewage systems may, in addition to the above, include one or more of the following:

(a) A sewage collecting system of the gravity flow, vacuum transport, or low pressure type to deliver sewage to the septic tank, and to which one or more building sewers may be connected. These systems may include such appurtenances as lift stations, raw sewage or grinder pumps, grease traps, grit chambers, and a balancing tank as appropriate to the system design.

(b) Pump or siphon chambers between the septic tank and the leaching bed and, in some designs, drop manholes within the leaching bed.

3 LOCATION OF COMPONENTS

The basic considerations and standards influencing the location of the leaching bed are contained in the regulation and in Chapter 8 Article 2. The regulation requires that a septic tank be at least 1.5 metres from a building or structure, 3 metres from a property line and 15 metres from a lake, pond, reservoir, river, stream, spring or well, all measurements being horizontal. No specific clearances are given for the other components of the system such as grease traps, pump chambers, piping, etc. Except for components such as sealed pump chambers, it is recommended that they should comply with the clearances for septic tanks, particularly the lot line clearance. Leaching beds should, where possible, be located downstream from wells as far as ground water movement is concerned, particularly if shallow wells are utilized. Other influencing factors in determining the best arrangement of components on the property are:

(a) where dosing is not mandatory, an arrangement that will provide for gravity flow.

(b) where pumping is required a choice between,

  (i) gravity flow to the septic tank with an effluent pump to lift sewage to the leaching field (either to overcome elevation difference or for dosing), or

  (ii) a system using a raw sewage or a grinder pump to pump to the septic tank which has gravity flow to a leaching bed or, if the leaching bed is dosed, to a pump or siphon chamber.

(c) the need for a grease trap in the building sewers upstream of the septic tank in circumstances where unusual quantities of grease may be expected. e.g. fast-food outlet.

(d) the need for a balancing tank from which a stable flow can be pumped to the septic tank in cases where the peak daily or hourly sewage flows are much higher than average flows.

(e) the need to consider servicing of the septic tank when deciding its location. During the construction of the building and the sewage system access for construction equipment is not a problem. Access

to service the system (e.g. pump out the tank) after landscaping, fencing, etc., have been undertaken, should be considered in the original siting and in the landscaping plans.

4 PROPERTY EASEMENTS

As a general rule all components of a sewage system serving a building or buildings on a single lot or parcel of land should be contained within the same property. Approval of exceptions to this rule should be granted only in cases where the owner of the sewage system obtains and registers an easement entitling him to maintain, repair and replace any part of the sewage system not on his own lot or parcel of land. An exception is where the land on which part of the system is located is Provincial Crown land, or is a road allowance in which all the sewage system, or part thereof, could be owned and operated by the Crown, a municipality, or an organization created for such purposes and acceptable to the Director.

5 DAILY SEWAGE FLOWS

(a) Computation of the daily sewage flow to be used in design of the sewage system is most important and is a matter which an applicant for approval of a sewage system, which is not covered by design tables in the Regulation, should discuss with the approving authority prior to commencing design. Agreement should be reached on the total daily sewage flow, on the design daily sewage flow where it varies from day to day, and on the flow pattern within peak days.

(b) Peak daily flows-A flow-through Class 4 sewage system must be designed for peak flow conditions unless such conditions are infrequent and will not seriously affect operation of the system, or a balancing tank is installed to even out fluctuations in daily flows. Such a tank must be sized to accomodate flows at peak periods and include pumps which are controlled so as to discharge an even daily flow to the sewage system.

(c) Metering - Metered water consumption data, or metered sewage flow data, obtained for the building(s) served, or from similar installations, should be used with caution and a thorough understanding of the metering method and instrumentation installed. For example, at a camp ground having a total of 100 sites, made up of fully serviced sites for trailers, partially serviced sites, and unserviced sites,

with or without central comfort stations, a completely false design figure for sewage disposal could be obtained by dividing the metered monthly water consumption figure by 100, as there may have been days when only a limited number of sites were occupied. To be meaningful the daily occupancy of each type of site, and the daily water consumption figures, should be known so that a design figure for each type of site can be determined. To be most useful a continuous recording type of meter is preferred. Pumps installed in sewage systems also provide a means of obtaining flow data providing the pump on-time is recorded and the delivery rate is known.

(d) Residential - For purposes of computation, a daily sewage flow of 275 litres per person is recommended for design to account for the individual share of all types of water use in a house having modern appliances. This is a design figure rather than a average figure resulting from the metering of actual consumption. In smaller residences an allowance of two persons per bedroom is made but this is reduced in larger homes as it is unlikely that there will be, for example, 10 persons in a 5 bedroom house. Design recommendations are;

No. of Bedrooms	Daily Sewage Flow (Litres)
2 or less	1100
3	1600
4	2000
Over 4	add 300 litres per bedroom.

(e) Non-residential - assistance in determining daily sewage flows for different circumstances is provided in Appendices 9.3.1 and 9.3.2. The flows shown in these tables are minimal flows and, if evidence of larger flows exists or is suspected, the larger flow should be used. For circumstances not listed an assessment of flow may be made by using the most comparable circumstance which is listed, or by a determination based on a fixture usage. The approving authority should be as clear as possible on the proposed use of the planned facility. Some examples where water consumption (and therefore sewage flows) is difficult to predict are:

(i) shopping plazas - The developer should be required to show initial occupancy for any area in which sewage will be generated, other than from washrooms used by employees.

(ii) clubs, restaurants and bars - Sewage flows can vary considerably depending on the location and the type of restaurant or bar, or combination thereof. A small restaurant or coffee shop serving meals only is a different proposition from a larger one featuring evening entertainment as well as meals. Also some country facilities attract large numbers during weekends in relation to other days.

6 WATER CONSERVATION AND WATER CONSERVING DEVICES

(a) Wherever sub-surface sewage disposal is contemplated, or in use, water conservation is to be encouraged and measures taken to ensure protection of the sewage system from abnormal flows. Measures taken during construction to divert run-off, and to prevent the ingress of water from non-sewage sources, are discussed elsewhere. In addition water may be conserved by:

(i) the use of standard plumbing fixtures such as spring loaded taps and low volume pressure flushing devices on toilets and urinals. Such fixtures can be, considered as normal and are designed to reduce excessive waste rather than as water saving devices.

(ii) the use of a proprietary installations such as low volume flush toilets or a vacuum toilet combined with a vacuum sewer leading to the treatment tank.

(iii) the use of a Class 1 sewage system to remove the human waste loading from the septic tank system.

(b) Water saving devices may or may not be judged by the approving authority as cause to reduce the normal standard requirements for the septic tank or the leaching bed, as it could often be a simple matter for the owner to remove the proprietary system or device, for various reasons, and replace it with a normal fixture. The permanency of the claimed reduction is therefore the basis of any judgment to permit a system component to be smaller than would be required without the use of the unit or device. Some guidelines are provided hereunder:

(i) No reduction in the size of the septic or aerobic treatment tank is warranted as a result of a reduction of the sewage flow if the organic load remains the same.

(ii) In non-residential sewage systems, if the installation effecting the reduction is reasonably permanent in nature, such as a vacuum system as described in (a) (ii) above, the lower sewage flow may be used in the appropriate formula for computing the amount of distribution pipe required. The reduction in amount of distribution pipe should not be to an amount less than 40% of normal requirements, even where the sewage source is all from washrooms equipped with toilets that may reduce flows by more than 60%, and should not result in a smaller leaching bed than the minimum size permitted by regulation.

(iii) In a residential sewage system the distribution pipe requirements are found in Tables and a reduction is not considered practical when only part of the sewage volume, i.e. the toilet flush is reduced as other elements, i.e. baths, showers, laundry and kitchen, are the same.

(iv) A Class 1 sewage system may be installed in a residence to reduce the sewage loading on an existing sewage system which is overloaded, or to replace another form of Class 1 sewage system, such as a pit privy. However, if at that time, or in the future, there is reason to construct a new Class 4 sewage system for the disposal of grey water, it should be designed to meet the regulatory requirements for such systems as, should ownership change, or the present owner change his mind, the Class 1 sewage system may be removed and a flushing toilet installed.

(v) Other factors to consider are the ability of the reduced flow to adequately flush the sewer, the reliability of the device and the accuracy with which the reduced flow can be assessed.

(vi) If a leaching bed of less than normal size is authorized, consideration should be given to providing space for expansion of the leaching bed to normal size if required.

7 DESIGN OF THE SEPTIC TANK AND LEACHING BED

(a) Septic tank - Requirements are outlined in the regulation and Article 9.2. Typical septic tank details are illustrated in Drawings 9.3.1 and 9.3.2.

(b) Leaching beds - Requirements are outlined in the regulation and chapter 8. The size and layout of a leaching bed will be determined from the daily sewage flow and the soil and other site characteristics in the area proposed for construction of the bed. Design criteria is as follows;

(i) if an absorption trench bed is used the minimum length of distribution pipe shall be in accordance with Table 5 of the Regulations if the sewage system is serving a dwelling of not more than 5 bedrooms, or otherwise will be determined from the formula,

$$L = QT/200$$

where L is the total length of distribution pipe in metres, Q is the daily sewage flow in litres and T is the design percolation time in minutes per centimetre of the soil below the absorption trenches. Where the soil for 0.9 metres below the bottom of the trench is stratified and variable the value of I should be judged accordingly - (see Section 6.3.5). The minimum length of distribution pipe in an absorption trench leaching bed is 40 metres.

(ii) if a filter bed is used to serve a private dwelling it shall be sized in accordance with tables in the regulation. Otherwise, the size required shall be such that the loading on the surface of the filter medium does not exceed 75 litres per square metre per day when the daily sewage flow does not exceed 3000 litres, or 50 litres per square metre per day when the daily sewage flow exceeds 3000 litres. The maximum size of the filter surface in any one filter is 50 square metres. The filter type of leaching bed cannot be used with a septic tank system in which the daily sewage flow exceeds 5000 litres.

8 DESIGN OF MISCELLANEOUS TANKS AND APPURTENANCES

(a) General - The regulation requires that tanks, other than septic tanks, which are used in a Class 4 sewage system, shall meet with the requirements of CSA Standard CAN3-B66 respecting material standards, access, workmanship and construction methods and practices.

(b) Balancing tanks - A tank serving this purpose may be installed upstream of the septic tank when there are large fluctuations in sewage flow, either during the day. or from one day to another, and it is not prudent or practical to design a tank and leaching bed to handle such peak loads. An assessment is required of peak hourly or daily flows and hourly or daily flows at other times. In Class 4 sewage systems it is normally a variable daily flow that gives rise to the need for a balancing tank, e.g., a country restaurant may have a Saturday and Sunday loading far in excess of a weekday loading. The sewage system is then sized to treat a daily flow at least equal to the average daily flow for the week and a pump or pumps are installed to move this amount each day from the balancing tank to the sewage system, or possibly to more than one sewage system Tank size should be based on the peak volume of sewage that will accumulate during high flow days when the incoming sewage will exceed the outgoing pumping rate. Additional capacity should be provided above the highest level that the sewage will reach during peak flows so as to provide for unexpected peaks or pump failure. A high level alarm should be installed, to provide warning of unexpected high flow, pump failure or blockage.

(c) Pump chambers - A typical pump chamber is as shown in Drawing 9.3.3. If utilized to dose a leaching bed it must be designed to provide the dose volume between the on and off levels of the pump controls. A high level alarm should be installed to provide a warning at a level above the pump-on level but below the full or overflow level of the chamber. Pumps should be selected, usually as recommended by a pump supplier or professional designer, to meet the requirements of the pumping rate decided upon considering both the static and friction head losses in the delivery line and the pump characteristics. Pump chambers must be watertight and vented. Sealed units may be used indoors for either raw sewage or septic tank effluent. Chambers installed in-ground must have access provided

for servicing and repairs. Hardware and electrical fittings and wiring should be non-corrosive and meet the required codes for this type of use.

(d) Grease traps - A grease trap may be installed in a building sewer which connects a source of sewage producing a high volume of greasy waste to the sewage system. Without a grease trap the excess greasy waste may interfere with the treatment of the sewage and clog sewer lines and the inlet and outlet fixtures in the septic tank. Grease traps may be single or double compartment. A typical grease trap for outdoor installation is shown in Drawing 9.3.4. Grease traps are rarely required in residential sewage systems and are primarily used in systems serving kitchen wastes from motels, cafeterias, restaurants, hospitals, schools and other institutions. Some design and operating considerations are:

(i) a grease trap should not be used where a garburetor is installed as the solids will settle to the bottom of the trap and impede flow through the trap thus requiring frequent pump-out.

(ii) the trap should be located near the source where the wastewater is still hot so as to facilitate grease removal.

(iii) easy access for cleaning must be provided through a manhole cover which is designed to sustain the traffic imposed and is airtight to contain odours.

(iv) a grease trap should be cleared when the accumulation reaches about 75% of the grease storage capacity. In restaurants this may range from once a week to once every 2-3 months. A grease trap serves no purpose unless the required cleaning is done on a regular basis.

(v) design capacity can be calculated from the number and kind of sinks and fixtures discharging to the traps, or on the basis of the number of meals served. Recommendations are contained in Appendix 9.3.3.

(c) Manholes - Where manholes are required in a sewage collection system they should conform to the Ministry standards for manholes in municipal systems. An example is illustrated in Drawing 9.3.5. Where a septic tank is buried to a depth that requires a person servicing the tank to enter a manhole in order to gain access to the tank openings, a manhole of this type should be utilized or, if comprised of material other than concrete, should be similar in dimensions.

9 PIPING

(a) House connection or building sewer - A gravity flow pipe connecting the building drain to the septic tank or to a main sewer is a building sewer and is regulated under 0. Reg. 647, known as the Plumbing Code. It is required to meet the appropriate CSA or ASTM standards. The velocity in the building sewer at its entrance to the septic tank should not exceed 55 metres/min (approximately 3 feet per second), so as not to unduly disturb the settling action in the tank. Minimum inlet size is 4" inches (trade size) pipe. Where the building sewer is steeply graded the last pipe section may need to be levelled, or nearly so, to reduce velocity. When the building sewer is a force main through which raw sewage is pumped to the septic tank, either directly or from a balancing tank, the volume delivered per batch should not exceed 10% (and preferrably less) of the working capacity of the septic tank so as not to disturb the settling action in the tank.

(b) Sewers collecting sewage from more than one building sewer and leading to the septic tank should be professionally designed and piping and appurtenances should meet the Ministry's requirements for municipal sewer materials and construction. Proprietary collecting systems, such as vacuum transport systems should, in addition, comply with the manufacturer's specifications.

(c) Piping between the septic tank and the leaching bed -While the regulation does not so specify, it is recommended that piping and fittings connecting septic tanks or aerobic treatment tanks to leaching beds be of a type meeting the requirements of the Canadian Standards Association (CSA) standard, ASTM standard, or Canadian

Government Specifications Board (CGSB) specification, which is appropriate for the type of material used in buried lines in sewage disposal systems. For example, the plumbing code requires that all pipe and fittings containing polymeric plastics (e.g. PVC), which are used in the building sewer which connects the building drain to the septic tank or aerobic treatment plant, shall meet the requirements of CSA Standard 182-1-M1977 and this standard provides a basis on which the acceptability of non standard plastic pipes can be judged. Additional recommendations are:

(i) all fittings must be compatible with the pipe which is used.

(ii) sewers should be sloped to permit draining without sewage collecting in pockets in. the line. For gravity sewers a minimum velocity of 0.6m/s (2 fps) is desirable. The slope should be at least 10 mm/m (about 1/8" per ft.).

(iii) pipe used in forcemains in areas of rough terrain and variable soil cover, such as are found in the Canadian Shield, should. preferably be flexible plastic pipe manufactured to a standard as required for the pressure encountered (minimum recommended about .345 MPa or 50 psi) as rigid pipes are more susceptible to damage by frost or separation at connections.

(iv) the forcemain may be equipped with a check valve to prevent backflow through the pump (not to prevent draining if desired). Such check valves are recommended where the line capacity exceeds about 25 litres, particularly when lifting sewage from a small pump chamber rather than in dosing systems. Alternatively the pump chamber should be increased in volume if a check valve is omitted and the line drains after each pumping cycle.

(v) forcemains and appurtenances should be buried to a depth required locally for frost protection or provided with equivalent insulation.

(vi) burying of lines may also be required as protection against gnawing animals.

(vii) when connecting lines run across areas of heavy traffic deeper burial against frost is normally required and protection against physical damage can be provided by encasing the force main in a culvert or larger diameter pipe.

(viii) hardware, such as clamps used in connections in lines of plastic pipe, should be of stainless steel to avoid rust problems.

(ix) piping should be carefully stored to avoid damage due to exposure to the elements (e.g. some plastics become brittle in prolonged exposure to sunshine) or to improper support in stacking. Pipe sections, found on inspection to be out of round, sagged or deteriorated, should not be installed. For plastic piping CSA Standard 182.11 provides details on the storage, handling and installation, inspection and testing of piping.

(d) Distribution pipe - The Regulation does not specify distribution pipe except as to minimum diameter. The most commonly used pipe is smooth-walled plastic pipe, e.g. PVC, made in lengths of about 3 metres, having two rows of perforations spaced about 1200 apart and layed so that the centre of the bottom of the pipe is equidistant between each row of holes. Perforation hole size and spacing vary somewhat between manufacturers. The recommendations of CSA Standard B182-1-M1977 require holes to be clean cut, 12 millimetre minimum diameter, in two parallel rows 120 $\pm$ 5 degrees apart with hole spacing so as to provide at least 5800 square millimetres of hole in each standard length of pipe (about 3 metres or 10 feet). For example, 2 rows of holes 13.6 millimetres in diameter at a hole spacing of 150 millimetres would provide 5810 square millimetres of opening in a 3 metre length of pipe. In the absence of regulatory specifications for pipe the following points are recommended for consideration of those approving installations:

(i) Preferred pipe should be pipe manufactured to meet the appropriate standards for the material used. For example, CSA Standard 182.1 M1977 covers plastic drain and sewer pipe and fittings and ASTM Standard D2729 covers PVC pipe. The holes size and spacing in CSA Standard 182.1 is preferred. ASTM Standard C508 covers asbestos cement pipe, ASTM Standards C4 and C412 "extra quality" cover tiles of clay and concrete respectively.

(ii) Pipe must be protected during storage at the plant and at the site to prevent damage by the sun, or by freezing, and stored in a manner that prevents sagging. Damaged pipe lengths, or ones which have become warped or sagged, should not be accepted in an installation.

(iii) Light weight corrugated polyethelene pipe, of the type which has been rolled on large drums and is commonly used for field drainage, is not considered suitable as distribution pipe.

(iv) Neither tiles or corrugated polyethelene pipe are recommended for use in dosed leaching beds where smooth walled pipe is preferred.

(v) The use of clay tiles is discouraged in leaching beds in sewage systems which are not in continuous use. The tiles absorb moisture and, if subjected to freezing temperatures in periods when the system is not used, may crack and break up.

10 PUMP SELECTION

(a) There are various types of pumps on the market today which can handle sewage. It is important, however, to know the solids handling capacity of each make of pump since it could have an impact on the pump recommended for use. The most practical type to select will depend, in part, on whether the pump will be handling raw sewage or effluent from a septic tank. While there are many types of pumps with different operating principles the most common type used in on-site sewage systems is a submersible centrifugal pump, designed to handle either raw domestic waste or effluent from the tank. Grinder pumps are also used in sewage systems where raw sewage is to be pumped from one or more sources through a low pressure force main of small diameter.

(b) Pumps should be selected according to the recommendations of the manufacturer considering the quality and quantity of the sewage to be pumped and the static and friction heads to be overcome. Friction head in the force main is directly related to the type of pipe used, its diameter, the distance over which the sewage is to be pumped and the number and type of fittings used in the line. As previously noted, a pump selected to pump raw sewage to a septic tank should be set to deliver a volume per pumping cyle not greater than 10% (and preferably less) of the working capacity of the septic tank so as not to disturb the settling action in that tank.

(c) When pumping is required to dose a leaching bed a single pump may be used in relatively small systems, but it is recommended that two pumps, operating alternately, be installed. A high level alarm should be included in the chamber to alert the occupants if the pump(s) should fail to function. The liquid level which actuates the alarm should be above the pump-on level but below the full capacity of the chamber. In a two pump system the pump cycles should be timed to ensure even dosing. In large leaching beds each pump can be connected to one half of the leaching bed by a separate force main with cross-connections to permit the dosing of the other half bed if necessary.

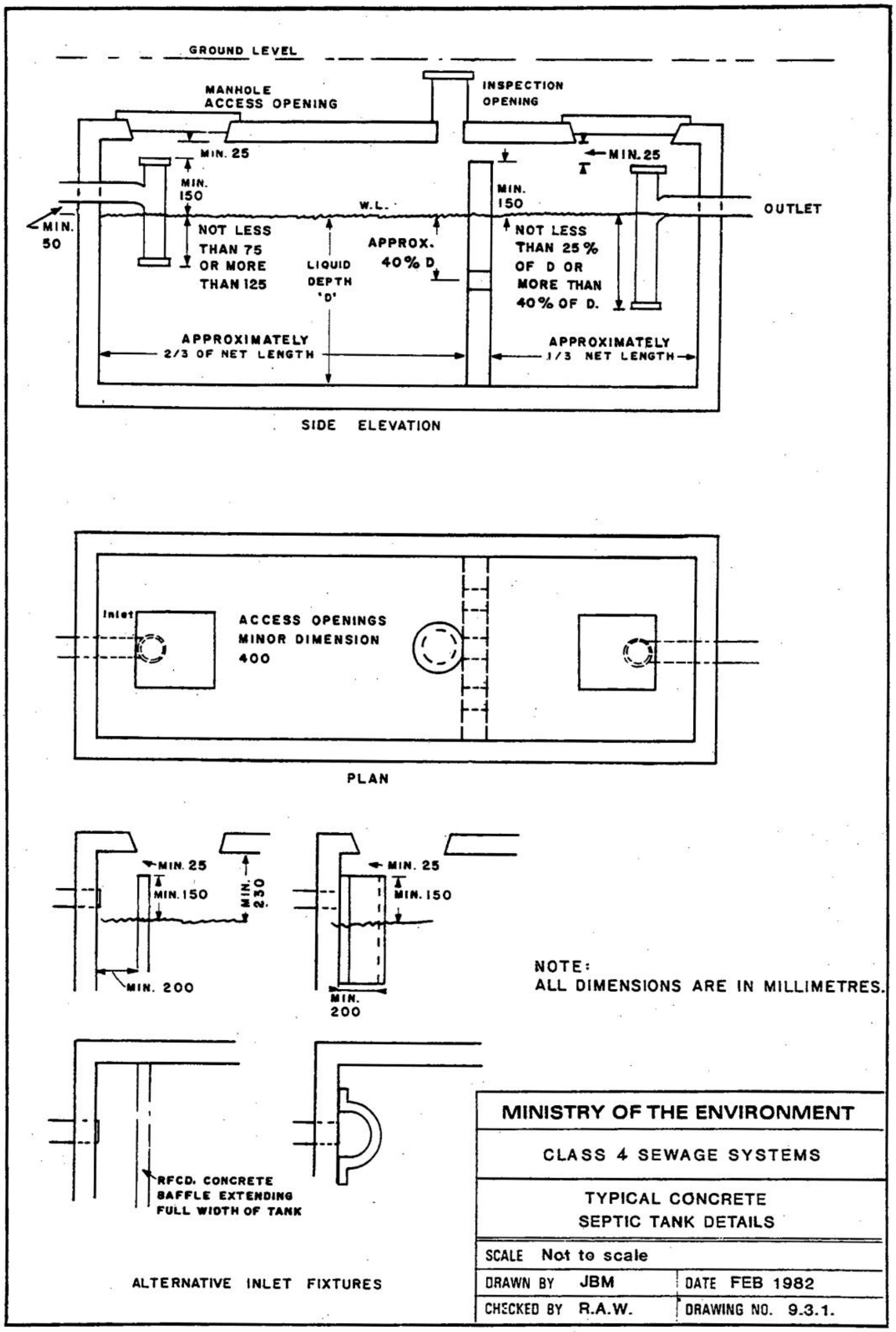
11 SIPHONS

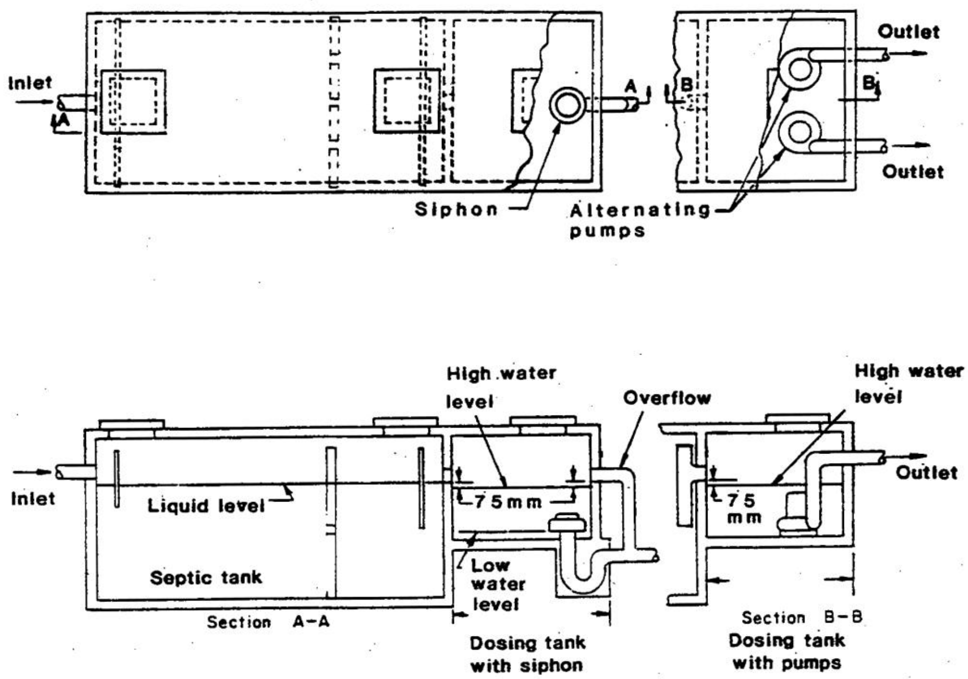
(a) When properly designed and installed, siphons will give satisfactory results. As they contain no moving parts, they are usually more dependable than pumps. If the septic tank and leaching bed are operating properly a siphon should not malfunction.

(b) Siphons require an operating head of between 0.3 and 1.5 metres. If the head available is inadequate to permit the use of a siphon, a pump, or pumps, will be required.

(c) The manufacturer's instructions should be carefully followed in installation, particularly as to elevations and dimensions. Their detailed drawings show the dimensions and performance characteristics. Drawing 9.3.6. shows a typical siphon and the type of detail to be found in manufacturers' drawings. Complete tests should be carried out to ensure that there are no leaks in the piping or the bell casting. New siphons should be primed with water and a leakage test carried out at that time.

(d) Where a large leaching bed is to be dosed by a siphon, proposals may be made to install twin siphons operating alternately out of the same chamber so that each siphon doses half the leaching bed. The Ministry experimented with a model installation after receiving reports that such twin installations were difficult to adjust so as to function alternately. The results showed that, while both siphons may function about the same number of times in a test spanning a number of siphon operations, the siphons did not alternate, e.g. one may operate several times in a row before the other is activated. Thus, if true alternation of delivery is desired, pumps are recommended.


GROUND LEVEL
MANHOLE ACCESS OPENING
INSPECTION OPENING
MIN. 25
MIN.25
MIN. 150
MIN. 150
W.L.
OUTLET
MIN. 50
NOT LESS THAN 75 OR MORE THAN 125
LIQUID DEPTH 'D'
APPROX. 40% D
NOT LESS THAN 25% OF D OR MORE THAN 40% OF D.
APPROXIMATELY 2/3 OF NET LENGTH
APPROXIMATELY 1/3 NET LENGTH
SIDE ELEVATION
Inlet
ACCESS OPENINGS MINOR DIMENSION 400
PLAN
MIN. 25
MIN. 150
MIN. 230
MIN. 200
MIN. 25
MIN. 150
MIN. 200
RFCD. CONCRETE BAFFLE EXTENDING FULL WIDTH OF TANK
ALTERNATIVE INLET FIXTURES
NOTE:
ALL DIMENSIONS ARE IN MILLIMETRES.
MINISTRY OF THE ENVIRONMENT
CLASS 4 SEWAGE SYSTEMS
TYPICAL CONCRETE SEPTIC TANK DETAILS
SCALE Not to scale
DRAWN BY JBM
DATE FEB 1982
CHECKED BY R.A.W.
DRAWING NO. 9.3.1.

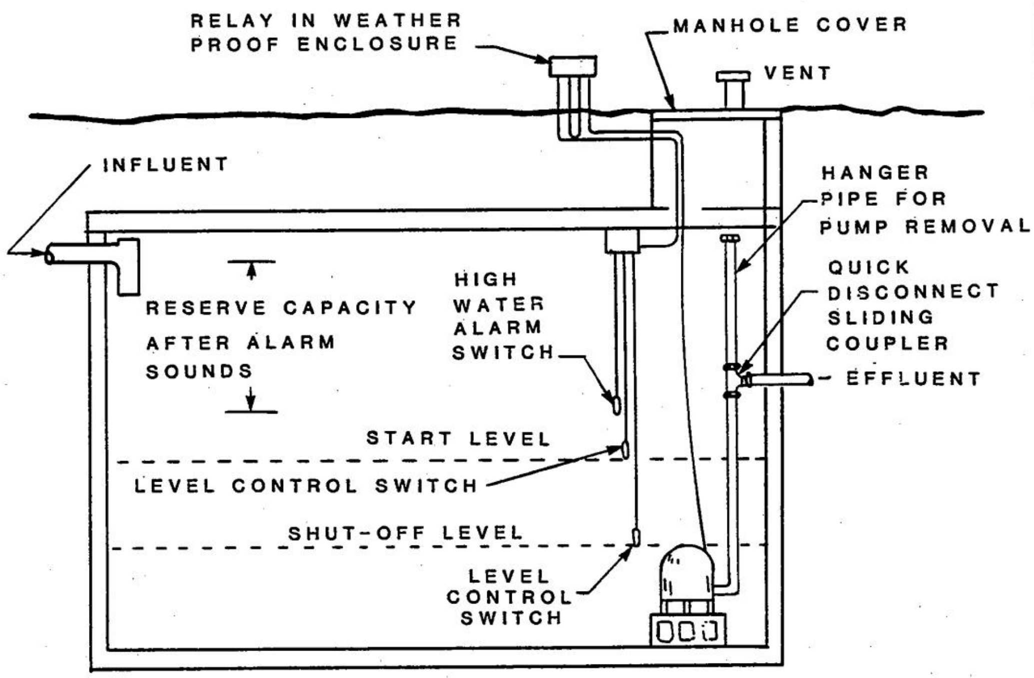


NOTE:

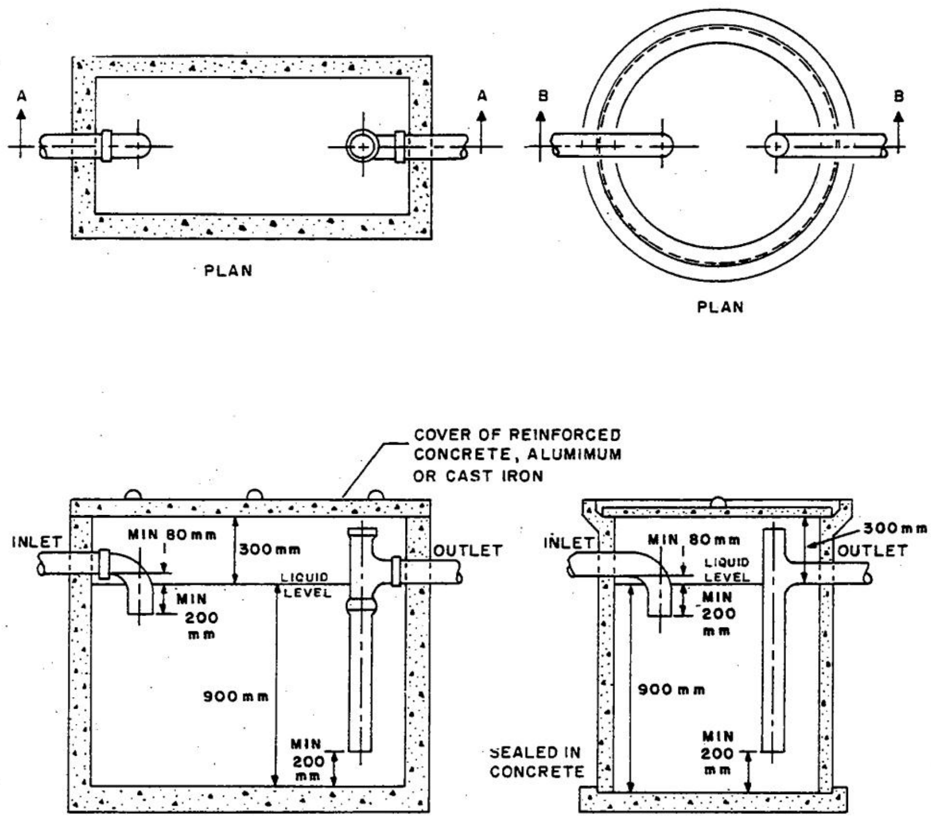
Dosing tank must be used when the total length of distribution pipe in the leaching bed exceeds 150 metres.
Duplicate alternating pumps,each serving one half of the leaching bed are shown.

MINISTRY OF THE ENVIRONMENT	
CLASS 4 SEWER SYSTEMS	
TYPICAL INSTITUTIONAL SEPTIC TANK WITH INTEGRAL DOSING TANK	
SCALE Not to scale	
DRAWN BY JBM	DATE FEB. 1982
CHECKED BY R.A.W.	DRAWING NO. 9.3.2.

TYPICAL DOSING CHAMBER WITH PUMP



MINISTRY OF THE ENVIRONMENT	
PRIVATE SEWAGE SYSTEMS	
TYPICAL DOSING CHAMBER WITH PUMP	
SCALE NOT TO SCALE	
DRAWN BY J.B.M.	DATE DEC. 1981
CHECKED BY R.A.W.	DRAWING NO. 9.3.3.



SECTION A–A
CONCRETE BOX

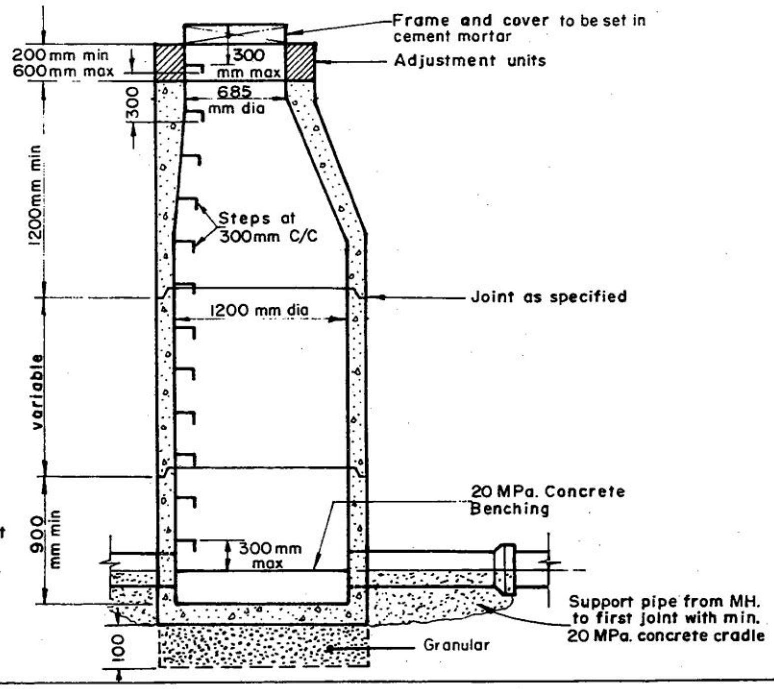
SECTION B–B
CLAY TILE PIPE

TYPICAL GREASE TRAPS

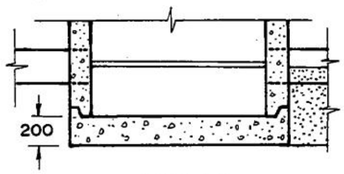
THE MINIMUM CAPACITY SHOULD BE ABOUT 450 LITRES FOR SMALL INSTALLATIONS SERVING UP TO ABOUT 50 PEOPLE WITH PROPORTIONATELY LARGER CAPACITIES FOR LARGER POPULATIONS.

CONCRETE PIPE OR CLAY TILE MAY BE USED TO CONSTRUCT A GREASE TRAP. MINIMUM DIAMETER OF GREASE TRAP IS 750 mm.

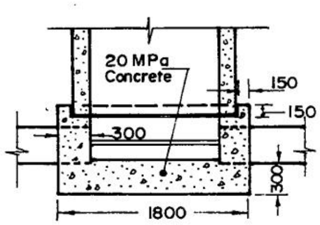
MINISTRY OF THE ENVIRONMENT			
PRIVATE SEWAGE SYSTEMS			
TYPICAL GREASE TRAPS			
SCALE	N.T.S.		
DRAWN BY	R.S.	DATE	NOV. 1976
CHECKED BY	R.A.W.	DRAWING NO.	9.3.4.



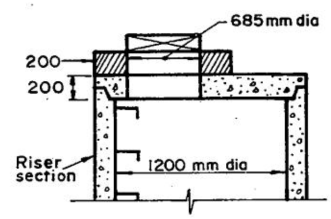
ALTERNATIVES



TYPE A
PRECAST SLAB BASE



TYPE B
CAST IN PLACE BASE



TYPE C
PRECAST FLAT TOP

Flexible joint 300 mm max. from Manhole wall, in lieu of concrete cradle

TYPE D

Approved flexible watertight pipe connector in MH. opening in lieu of concrete cradle

TYPE E

PIPE SUPPORT AT MANHOLE

NOTES:

A Precast M.H. sections to conform to ASTM. C-478 and manufacturer to be on MTC designated sources list.

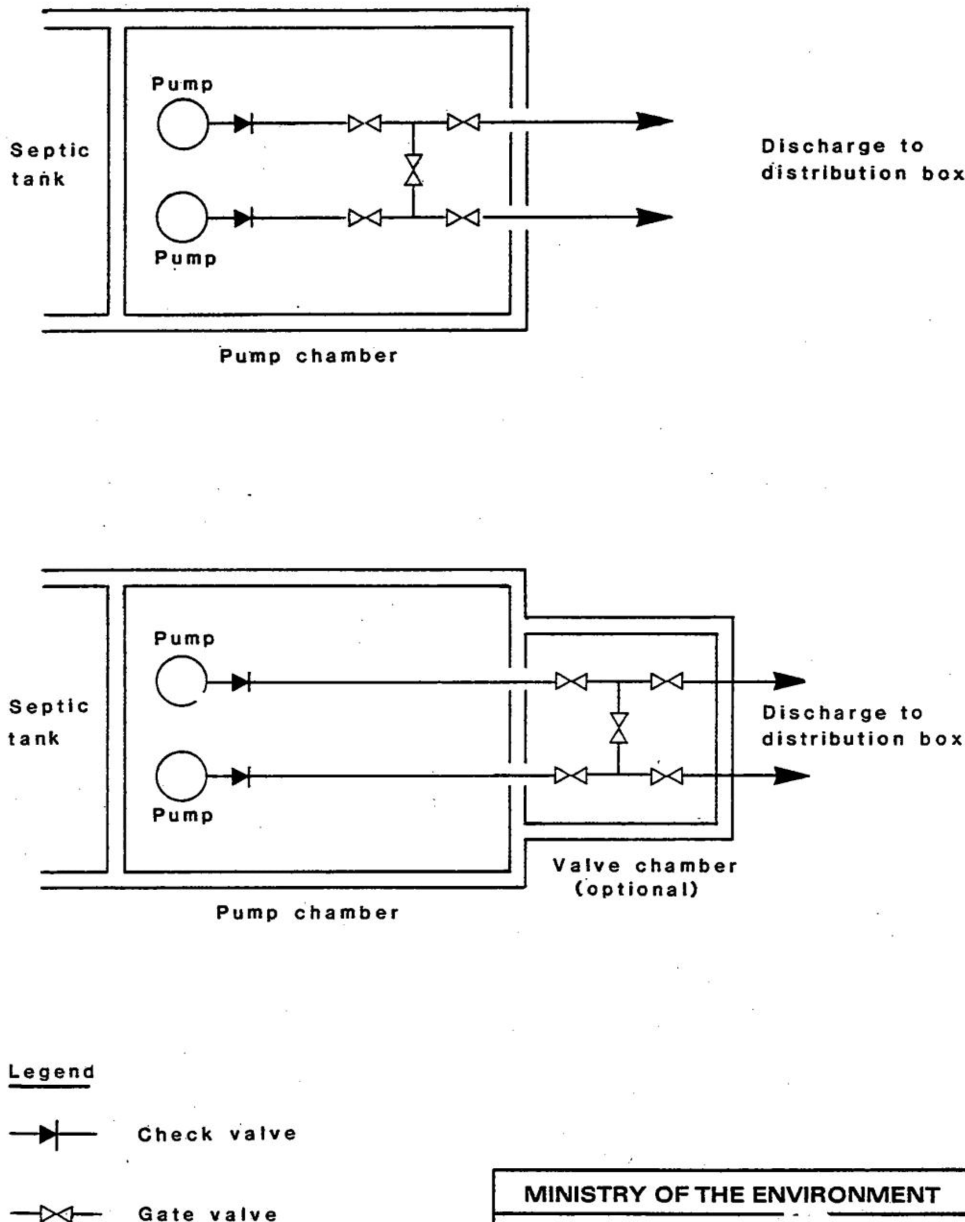
B Special base design required for depths greater than 9.0 m

C Fill joints, lifting holes and pipe connections and parge Adjustment units on outside 15 mm thick with 1:3 non-shrink mortar mix.

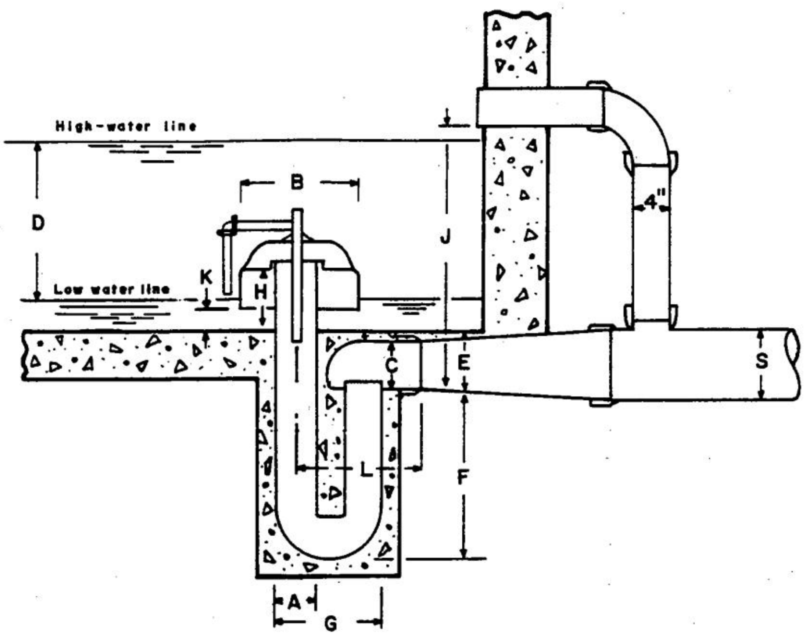
D Use alternative base, top, pipe support or connector, steps, frame and cover and/or benching where specified.

E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Date	1983 12 01	Rev
PRECAST MANHOLE 1200 mm DIAMETER	Date		
	OPSD - 1001.01		



MINISTRY OF THE ENVIRONMENT	
PRIVATE SEWAGE SYSTEMS	
TYPICAL PIPING AND VALVE ARRANGEMENT- PUMP CHAMBERS	
SCALE Not to scale	
DRAWN BY JBM	DATE FEB. 1982
CHECKED BY R.A.W.	DRAWING NO. 9.3.6.



A DIAMETER OF SIPHON
B DIAMETER OF BELL
C DIAMETER OF DISCHARGE HEAD
D DRAWING DEPTH
E INVERT BELOW FLOOR
F DEPTH OF TRAP
G WIDTH OF TRAP
H HEIGHT ABOVE FLOOR
J INVERT TO DISCHARGE (D+E+K)
K BOTTOM OF BELL TO FLOOR
L CENTRE OF TRAP TO END OF DISCHARGE ELL
S DIAMETER OF CARRIER

AVERAGE DISCHARGE RATE IN L/min
MAXIMUM DISCHARGE RATE IN L/min
MINIMUM DISCHARGE RATE IN L/min
SHIPPING WEIGHT IN KILOGRAMS

MINISTRY OF THE ENVIRONMENT	
PRIVATE SEWAGE SYSTEMS	
TYPICAL SIPHON DETAILS	
SCALE APPROX. 1:16	
DRAWN BY J B M	DATE SEPT 1976
CHECKED BY R A W	DRAWING NO. 9.3.7.

DAILY SEWAGE FLOW DATA

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
AIRPORTS		
- Not including food	per passenger	20
- Catering	per meal served	12
- Employees	per person	40
ASSEMBLY HALLS		
- Where no kitchen or meals provided	per person	8
- With varying facilities provided (range)	per person	8-36
BAR OR COCKTAIL LOUNGE		
- Separate establishment		
- min. food service	per seat	125
- Part of a hotel or motel	per seat	70
- Customer	per customer	8
- Staff	per employee	50
BEAUTY SALON	per station	650
	per person	130
BOWLING ALLEYS		
- With no bar or restaurant	per alley	400
- With bar and/or restaurant	per alley	800
CAMPS		
- Day camps - no meals	per person	50
- Day & night camps	per person	150
- Primitive camps	per person	40
- Summer Camps with showers, toilets, handwashing, & cooking	per person	150
- as above without flush toilet	per person	75
- Construction camps – Flush toilets	per person	200
- No flush toilets		125
- Migrant workers camp - central bathroom	per person	125
- Youth camps	per person	200
- Resort camps - limited pumping	per person	200
- Resort camps - non resident staff	per person	50
- Luxury camps	per person	400

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
CAMPGROUNDS TENT AND TRAILER PARKS *		
Sites with water and sewer connections for recreational vehicles (e.g. trailers and motor homes)-TRL Sites		
• Sewer connected to sewage system(SS) at nearby comfort station (CS)	per site	375(475)- 425(525)
• Sewer connected to a SS other than the one at the CS		
- sewage generated at the CS	per site	275-375
- sewage to connected SS when CS is available	per site	100(200)- 60(150)
- sewage to connected SS when no CS available	per site	125(425)
Sites with no sewer connections. Water supplied by a connection or from a nearby faucet.		
• sewage generated at a nearby CS	per site	275-425
• sewage to vehicle tanks (TRL sites)	per site	60(150)-100(400)
• Grey water to nearby Class 2 SS	per site	15-25

* For more details on designs flows and related assumptions see Section 14-2-16 and Appendix 14.2.1. Figures in brackets are for tank design.

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
(CAR)WASH		
- Hand wash	per car	200
- Truck wash	per truck	400
CHURCHES		
- With kitchen facilities	per sanctuary seat	30
- No kitchen facilities	per sanctuary seat	15
- Kitchen wastes - paper service	per meal	5
- Kitchen wastes - normal service	per meal	15
COUNTRY CLUBS		
- Residents	per person	375
- Non residents - no meals	per person	100
- Showers during use	per fixture	1800
- Water closets	per fixture	550
- Wash basins	per fixture	350
- Urinals - hand flush	per fixture	350
- Showers	per person	40
- Day Staff	per person	50
DANCE HALLS		
- Hall - washrooms only - per day in use	per m^2	15
- Dance hall restaurant	per seat	125
- Dance hall bar	per seat	20
- Dance hall plus restaurant plus bar	per patron	150
DAY CARE CENTRES - Staff plus children	per person	75

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
DOG KENNELS	per enclosure	75
DINING HALLS - see Restaurants		
DWELLINGS		
- Single family houses, apartments condominiums, cottages, etc.	per person	275
- Each dwelling unit of -	1 bedroom	750
- Each dwelling unit of -	2 bedrooms	1100
- Each dwelling unit of -	3 bedrooms	1600
- Each dwelling unit of -	4 bedrooms	2000
- Add for each bedroom over 4	per bedroom	300
- Boarding or Rooming houses	per person	200
- Boarding or Rooming houses without meals or laundry	per person	150
- Non resident staff	per person	40
- Luxury Homes - 4 bedrooms	per residence	3000
- Luxury Homes - 5 bedrooms	per residence	3500
- Luxury Homes - add for each bedroom over 5		500
EMPLOYEES - VARIOUS LOCATIONS		
- Factory or plant workers per day or per shift - includes showers but no industrial waste	per person	125
- Factory or plant workers as above but no showers	per person	75
- Various buildings and places of employment - e.g. store employees, office workers -depends on facilities	per person	50 -75
- Medical Office buildings, dental offices and medical clinics		
- Doctors, nurses & medical staff	per person	275
- Office staff	per person	75
- Patients	per person	25
HOTELS - See Motels		
INSTITUTIONS		
- Hospitals - including laundry	per bed	750
- excluding laundry	per bed	550
- Nursing homes & rest homes	per bed	450
- Other institutional residences	per person	400
LAUNDRY		
- Household type automatic washer each use	- per fill, wash and rinse -	120
- Household type automatic washer each use	- as above plus permanent press	170

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
LAUNDRY (Cont'd)		
- Laundromat	- percustomer or per wash	170
- Laundromat per day	- per machine	2000
- Auto washers in apartment bldgs	- per machine	1200
MOTELS AND HOTELS		
Residential portion:		
- With full housekeeping facilities	per person	225
- With bath or toilet only (private)	per person	180
- With central bath only		150
Non residential portions:		
- With dining room, add	per seat	125
- With bar or cocktail lounge, add.	Per seat	70
- Non resident staff, add	per person	40
MOBILE HOME PARKS		
- Mobile home - single bedroom	per unit	750
- Mobile home - 2 bedrooms	per unit	1000
- Mobile home - 3 bedrooms	per unit	1200
PARKS, BEACHES, PICNIC GROUNDS, PUBLIC SWIMMING POOLS.*		
- Picnic and fairgrounds with bathhouses showers and flush toilets	per person	50
- Picnic and fairgrounds		
- flush toilets only	per person	20
- Swimming pools & beaches with bathrooms, showers and toilets	per person	40
* Varies with facilities provided. Based on parks and picnic grounds of about 75 people per acre.		
RESTAURANTS AND DINING ROOMS		
- Ordinary (not 24 hour) restaurant	per seat	125
- 24 hour restaurant	per seat	200
- 24 hour intercity freeway restaurant	per seat	375
- 24 hour intercity freeway restaurant with showers		400
- Auto dishwasher and/or waste disposer		
- ordinary restaurant .	per seat	12
- 24 hour restaurant	per seat	24
- Kitchen and toilet wastes only	per seat	115
- Kitchen and toilet wastes	per patron	30 - 40
- Kitchen waste only	per meal	12

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
RESTAURANTS AND DINING ROOMS (Cont'd)		
- Banquet rooms - each banquet	per seat	30
- Drive-in restaurants	per seat	125
- Drive-in - all paper service,	per car space	60
- Drive-in - all paper service	per inside seat	60
- Taverns, bars and cocktail lounges with minimum food service	per seat	125
- Night club restaurant	per seat	175
SCHOOLS		
- Day school with cafetaria, gym and showers	per person	90
- Day school with cafeteria or gym and showers	per person	60
- Day school without cafeteria or gym and showers	per person	30
- Boarding schools	per resident	275
- Boarding schools non resident staff	per person	50
SERVICE STATIONS		
- Car servicing (one service bay)	per car	40
- Catch basins in garage floors for floor cleaning	per basin	375
SHOPPING CENTRES		
- Retail stores - washrooms only	per square metre of store area	5
- Retail stores area - parking area	per parking space	6
- Retail store area – employees	per person	40
- Retail store area - toilet rooms	per toilet room	2000
THEATRES		
- Drive-in theatres - no food service	per car space	20
- Drive-in theatres with food service	per car space	40
- Auditoriums or theatres - no food	per seat	20
- Movie theatres	per seat	15

MISCELLANEOUS WATER USE ESTIMATES FOR SEWAGE FLOW COMPUTATIONS

	DETAIL	UNITS	ESTIMATED WATER SUPPLY NEEDS PER UNIT (LITRES)
1.	Showers		
	(a) Golf clubs	per person	40
	(b) Public parks, etc.	per fixture per hour of use	575
2.	Water Closets - Public parks,etc.	per fixture per hour of use	150
3.	Wash basins	per fixture per day	375
4.	Urinals (hand flush) Public parks, etc.	per fixture per hour of use	375
5.	Whirlpools type baths Depends on make and model.		
	- Types discharging after each use	per use	130-680
	- Recirculating type	per filling (or discharge)	1300 and up

DESIGN RECOMMENDATIONS FOR

GREASE TRAPS

1 Grease traps are made commercially with a rated capacity or may be made to suit the requirements of the site in which case they are generally similar to a septic tank;

2 The required liquid capacity of a grease trap may be determined from the number of meals served at the mealtime during which the most meals are served from the relationship.

Liquid capacity (L) = 10 to 12 x No. of meals served per mealtime.

3 Selection of a suitable commercial product may be made on the basis of wastewater flow as calculated from the number and kind of sinks and fixtures discharging to the trap. Design of a trap may also be based on this method. The following table indicates the approximate grease retention capacity (taken as the weight of grease that the trap can hold before its average efficiency drops below 90%) and the recommended maximum capacity of the trap per fixture discharging to the trap. The grease retention capacity in kilograms is approximately 0.24 times the flow rate in litres per min and the maximum capacity per fixture in litres is about 2.5 times the flow rate.

APPROXIMATE RATINGS FOR SELECTION OF COMMERCIAL GREASE TRAPS (1)

Type of Fixture	Flow Rate Litre/min	Grease Retention Capacity Rating Kg	Recommended Maximum Capacity per Fixture Connected to Trap Litres
Restaurant kitchen sink	60	14	150
Single-compartment Scullery sink	75	18	190
Double-compartment Scullery sink	95	23	240
2 single-compartment sinks	95	23	240

2 double-compartment sinks	130	30	330
Dishwashers for Restaurants:			
Up to 115 Litres water capacity	60	14	150
Up to 190 Litres water capacity	95	23	240
190 to 380 Litres water capacity	150	36	375

(1) Figures in the table approximate those in EPA DESIGN MANUAL FOR ONSITE WASTEWATER TREATMENT AND DISPOSAL SYSTEMS after conversion to SI units.

CLASS 4 SEWAGE SYSTEMS

CONSTRUCTION, OPERATION AND MAINTENANCE

1 INSPECTION AND APPROVAL OF A CLASS 4 SEWAGE SYSTEM

(a) Certificates of Approval are covered in Chapter 3 Article 3. The issue, or refusal, of a certificate is normally preceded by an inspection of the property and the proposal as submitted by the applicant. The certificate is the all important document and must include, either on the form itself, or on attachments which are referred to on the certificate, clear details of,

(i) the design approved by the issuing Director including, in any case where the applicant's details were inadequate, or have not been completely accepted, a clear description of the requirements, supported as required by drawings,

(ii) any conditions imposed in excess of regulatory requirements, with reasons, or any matters accepted less than the regulatory minimums. It is not necessary to include regulatory requirements as these must be followed in construction unless the terms of the certificate state otherwise.

(b) Chapter 15 outlines recommended procedures and points to cover in a site inspection and should be followed.

2 CONSTRUCTION CONSIDERATIONS

(a) The best design can be made ineffective if the contractor adopts poor practices and workmanship in construction, or if the contractor does not understand the basic principles of disposal of sewage to the soil and uses construction methods which may lead to quick installation, but may change the soil characteristics on which the design was based.

(b) Problems can also result from changes occurring to the site of the proposed sewage system between the time that the system is approved and the time that its construction is undertaken. For example, significant lot grading for other purposes, such as surface drainage, may expose soils in which the leaching bed is to be constructed which were not those assessed in the inspection prior to issue of

the certificate. Undesirable soils from excavation work may be spread over the leaching bed area to its detriment. Acceptable surface soils meeting the requirements of the minimum 0.25 metre soil mantle under a raised leaching bed may be stripped or reduced. Building contractors may severely damage the site by vehicle traffic or materials stacking.

(c) While the following precautions are by no means complete they include some points considered important if the approved sewage system is in fact to be installed in the manner required by the certificate of approval and the regulations, and if the basis on which it was accepted is not to be changed:

(i) For septic tanks, balancing tanks, pump chambers, distribution boxes:

- Avoid installing tanks in a location, or at an elevation, where surface runoff can enter the tank or where high ground water table can damage the tank and cause water to enter the system. As an alternate to burying a tank deeply when it is desired to obtain gravity flow from basement fixtures, the tank can be raised above the level of potential water damage and a basement sewage pump installed.

- Anchor tanks as required against uplift due to water pressure when tank is being emptied.

- Protect a septic tank against freezing. If all or partly above ground it should be mounded over with earth or insulated. In circumstances such as a seasonally occupied dwelling, or one which is intermittently used in winter, it may be advisable to empty the tank to a level below the frost line. The joint seal will be broken if the contents freeze in a tank of the type constructed in two halves (top and bottom section) and such tanks are not suited for use where they may freeze unless precautions are taken.

- Compact the base under the tank (preferrably sand base) to avoid subsequent settlement.

- Support distribution boxes on a concrete slab or on a footing carried to below frost to avoid settlement or heaving.

(ii) For the leaching bed and soil mantle area:

- Stake out the area to be occupied by the leaching bed and, if a filled bed, the area cover by the fill and the 0.25 metres of acceptable soil required where lateral movement will take place.

- Take measures to ensure that all damaging traffic is kept off the staked area and that it is not used for material storage in a manner that will lower its percolative capacity. Impress the importance of this on the owner and his cont ractors.

- Keep excavated material off the stacked area unless its placement is acceptable to the Director issuing the certi- ficate of approval.

- Do not construct a leaching bed, or place fill, when the soil is too wet. This depends on the soil type. If the soil/moisture content is such that a fragment of soil occurring approximately 0.25 metres below the surface, can easily be rolled into a thin roll or wire without breaking, the soil is too wet for construction purposes.

- Ditching or other measures required in the certificate of approval to divert surface or sub-surface drainage from the area of the leaching bed, should be constructed prior to construction of the leaching bed if necessary to protect the site during this period.

- If an area is levelled for the construction of a leaching bed, or mantle, using imported fill, the surface of the soil on which the fill is to be placed should be scarified prior to fill placement.

- On significant slopes, an area leveled for a leaching bed to be constructed in imported fill should extend under all parts of the bed areas in which distribution pipes are located so as to avoid uneven settlement that may occur if the absorption trenches are partly over an area of excavation and partly in fill placed on the natural slope.

- Fill should be dumped to one side of the surface on which it is to be placed and pushed over this area in layers so that the equipment is at all times running on the fill rather than on the soil on which it is placed.

- Fill selected from granular deposits of essentially uniform material should be taken from the “B” zone to provide a leaching bed with the best phosphorus attentuation characteristics obtainable from a material of that grain size distribution.

- Fill material delivered to site should be of the same percolative capacity as assumed in design. Inspectors should become familiar with the quality of fill at all principle sources in their area and, where possible, the design of filled beds should be based on the quality of material in the source to be used by the contractor.

- Care must be taken in the placing of the stone in which the distribution pipes are located to ensure that the pipes are well supported throughout their length, are not damaged during placement of the stone and are at their correct slope after the stone is placed. Levels throughout the system should be established by use of a surveyor's level.

- The bottom and side walls of trenches excavated in cohesive soils should be roughed (e.g. raked) prior to placement of the stone layer.

- The barrier placed on top of the stone layer must effectively prevent soil particles from entering and plugging the voids in the stone during and after back filling. The

regulation requires a layer of untreated building paper, straw, pea gravel or other like material to form the barrier. Of these, untreated building paper, provided it contains no holes, or compressed straw, are preferable. Synthetic filter fabrics produced in long rolls of varying width are also effective. Spunbonded polyofins are generally the best suited and are less likely to tear than building paper. Backfilling must be carefully done to avoid tearing the fabric in the barrier.

(iii) Regarding equipment and material:

- Light tracked equipment is recommended.

- Stone used in absorption trenches should be free of fine material. Some limestones that have been crushed and screened to meet regulatory requirements are prone to break down in subsequent handling, storage and transportation to produce some rock flour. If such rock flour is prevalent in the stone delivered to the site the stone should be washed (hosed) before placing.

- Pipe stored on site should be adequately supported throughout the length of each pipe section so as to avoid sagging. Plastic pipe should be kept covered to prevent damage by the sun. Plastic pipe which has become brittle or is found on inspection to be out of round, sagged or deteriorated should not be installed. CSA Standard 182.11 provides details for the storage, handling, installation, inspection and testing of piping.

3 OPERATION AND MAINTENANCE OF CLASS 4 SEWAGE SYSTEMS

(a) The owner of a sewage system is responsible for keeping his system operating in accordance with the requirements of the regulation and the certificate of approval.

(b) Cleaning - Septic tanks should be cleaned before too much sludge or scum is allowed to accumulate. If either approaches too closely to the bottom of the outlet device, particles will be washed out of the tank and enter the leaching bed. They may cause clogging of the absorption trenches and result in break-out of sewage to the ground surface or cause sewage to back-up in the plumbing fixtures. When a leaching bed is clogged in this manner, it is necessary to clean the tank. It may also be necessary to construct a new disposal field or take measures to rejuvenate the old one. Tanks meeting the minimum regulatory capacity will give a reasonable period of good operation before cleaning becomes necessary. There are wide differences in the rate that sludge and scum will accumulate from one sewage system to another. It is estimated that one tank out of 20 will reach the danger point, and should be cleaned, in less than 3 years. Tanks in large sewage systems should be inspected at least once a year and those in residential systems at least once in each 2 year period, with cleaning carried out when necessary. Cleaning every 3-5 years can be considered normal.

(c) Inspection for cleaning:

(i) Although it is difficult for most homeowners, actual inspection of sludge and sum accumulations is the only way to determine definitely when a given tank needs to be pumped. When a tank is inspected, the depth of sludge and scum should be measured in the vicinity of the outlet baffle. The tank should be cleaned if either the bottom of the scum mat is within approximately 3 inches of the bottom of the outlet device, or the sludge comes within the limits specified on Drawing 9.4.1. This applies to each compartment.

(ii) Scum can be measured with a stick to which a weighted flap has been hinged, or with any device that can be used to feel out the bottom of the scum mat. The stick is forced through the mat, the hinged flap falls into a horizontal position, and the stick is raised until resistance from the bottom of the scum is felt. With the same tool, the distance to the bottom of the outlet device can be found.

(iii) A long stick wrapped with rough, white towelling, lowered to the bottom of the tank, will show the depth of sludge and the liquid depth of the tank. The stick should be lowered behind the outlet device to avoid scum particles. After several minutes, if the stick is carefully removed, the sludge line can be distinguished by sludge particles clinging to the towelling.

(d) Disposal of septage - In most communities where septic tanks are used, there are firms which conduct a business of cleaning septic tanks. The local Health Unit can make suggestions on how to obtain this service. Cleaning is accomplished by pumping the contents of the tank into a tank truck. Septic tanks should not be washed or disinfected after pumping. A small residual of sludge should be left in the tank for seeding purposes. The material removed must be disposed of by a method approved by the local authorities.

(e) Precautions in cleaning - No person, except those licensed and properly equipped to service and maintain septic tanks, should enter a tank. For those carrying on such activities, care should be taken not to enter the tank until it has been thoroughly ventilated and gases have been removed to prevent explosion hazards or asphyxiation of the workers. Anyone entering the tank should have one end of a stout rope tied around his waist, with the other end held above ground by another person strong enough to pull him out if he should be overcome by any gas remaining in the tank. Preferably, forced ventilation should be continued while anyone is in the tank. Licensed persons servicing septic or other tanks in a sewage system should be familiar with and follow the provisions of the Occupational Health and Safety Act and Regulations for Industrial Establishments wherever they apply.

(f) Chemicals:

(i) The functional operation of a septic tank is not improved by the addition of disinfectants or other chemicals. In general, the additary products which are claimed to "clean" septic tanks contain sodium hydroxide or potassium hydroxide as the active agent. Such compounds may result in sludge bulking and a large increase in alkalinity, and may interfere with digestion. The resulting effluent may severely damage the soil structure and cause accelerated clogging, even though some temporary relief

may be experienced immediately after application of the product.

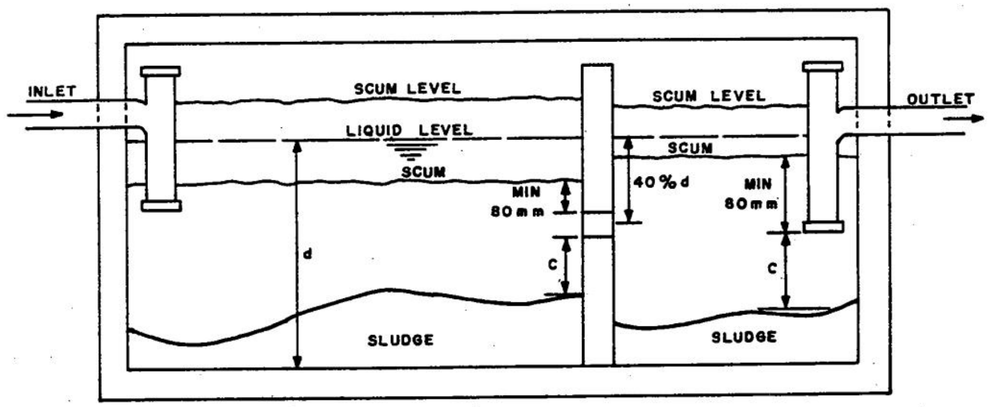
(ii) Frequently, however, the harmful effects of ordinary household chemicals are overemphasized. Small amounts of chlorine bleaches, added ahead of the tank, may be used for odour control and will have no adverse effects. Small quantities of lye or caustics normally used in the home, added to plumbing fixtures, are not objectionable as far as operation of the tank is concerned. If the septic tanks are as large as required by regulation, dilution of the lye or caustics in the tank will be enough to overcome any harmfull effects that might otherwise occur.

(iii) Some 1,200 products, many containing enzymes, have been placed on the market for use in septic tanks, and extravagant claims have been made for some of them. As far as is known, none has been proved advantageous in properly controlled tests.

(iv) Soaps, detergents, bleaches, drain cleaners, or other material, as normally used in the household, will have no appreciable adverse effect on the system. However, as both the soil and essential organisms might be susceptible to large doses of chemicals and disinfectants, moderation should be the rule. Advice 0f responsible officials should be sought before chemicals arising from a hobby or home industry are discharged into the system.

(v) Absorption trenches or filters can become clogged due to the plugging of the voids in the stone layer with soil particles, or due to the build-up at the soil/sewage interface of a black, slimy deposit composed of organic wastes, bacteria, inorganic precipitates and other debris, occurring due to the age of a system or to its overloading with solids. A combination of these causes may also occur. Where a slimy deposit is causing or contributing to clogging, rejuvenation of the soil/sewage interface may be accomplished by' removing any stagnant water from the system and injecting a strong solution of hydrogen peroxide. This form of chemical restoration was developed and patented (1977) by the Wisconsin Alumni Research Foundation (WARF) and the process named POROX. Applications using hydrogen peroxide to restore leaching beds must be licensed by WARF.

Because of the dangers of handling this strong oxidant, this treatment should be done by professionals. Confirmation that slimy deposits are clogging the field can be determined by measuring the liquid level in one or more absorption trenches and comparing it to the level of ground water in an augered hole located a few feet from the bed perimeter. Inspection of the trenches by exposing portions at two or more dispersed points in the leaching bed will indicate whether the clogging is general in all distribution lines and if the voids in the stone are filled, or partly filled, with soil. If the voids are filled POROX treatment would not have as lasting an effect. If judged suited to rejuventation by POROX, it is important that the septic tank be pumped and that all static liquid is removed from the absorption trenches prior to the treatment.



LIQUID CAPACITY OF TANK	MIN. CLEARANCE "c" (mm) BOTTOM OF OUTLET FIXTURE TO TOP OF SLUDGE. (BOTH COMPARTMENTS)		
	LIQUID DEPTH 900mm	LIQUID DEPTH 1200mm	LIQUID DEPTH 1520mm
2700 LITRES	200mm	300mm	380mm
3600 LITRES	100mm	150mm	250mm
4500 LITRES	100mm	150mm	200mm

MINISTRY OF THE ENVIRONMENT

CLASS 4 SEWAGE SYSTEMS

SEPTIC TANK
MAXIMUM SCUM & SLUDGE BUILDUP
PRIOR TO PUMP OUT

SCALE	N.T.S.		
DRAWN BY	R.S.	DATE	FEB. 1982
CHECKED BY	R.A.W.	DRAWING NO.	9.4.1.

10

CHAPTER 10

11

CHAPTER 11

CLASS 5 SEWAGE SYSTEMS

CHAPTER 11

CLASS 5 SEWAGE SYSTEMS

CLASS 5 SEWAGE SYSTEMS

1 DEFINITION

A Class 5 sewage system is a sewage system which requires or uses a holding tank for the storage or retention of sewage at the site where it is produced prior to its collection by a Class 7 sewage system (a hauled sewage system).

2 APPROVAL

(a) In accordance with Section 64 of the Act, a Certificate of Approval is required for a Class 5 sewage system. An application for a Certificate of Approval will be made in accordance with Chapter 3, Article 3.

(b) In accordance with Section 67 of the Act, a Use Permit is required for the use and operation of a Class 5 sewage system. Use Permits are dealt with in Chapter 3, Article 4.

3 LOCATION

A Class 5 Sewage System, constructed after April 16, 1974 shall be located so that it is wholly contained within the lot or parcel of land on which the building or structure, in connection with which the sewage system will be used, is located. If this is not possible, the provisions of section 5 of the Regulation respecting registered easements, or the written approval of the authority having jurisdiction over the land on which any part of the sewage system is located, shall apply.

4 POLICY

(a) Proposals to use holding tanks for lots in plans of subdivision or applications for severance should not be accepted, as a Class 5 system is not, by itself, a complete sewage disposal system. A Class 5 sewage system is costly to operate, places restrictions on the owner and is dependent on a Class 7 sewage system for waste disposal. The availability and continued reliability of a Class 7 sewage system cannot always be determined at the time plans are reviewed. Exceptions may be made where:

(i) The contemplated subdivision of land proposes the use of holding tanks as an interim measure until connections can be made to municipal sewers which are planned for the near future.

(ii) The proposed land use is for a special commercial operation such as a small slaughterhouse or laundromat.

(iii) The proposed land use is for a temporary operation.

(b) Proposals to install a Class 5 sewage system as the system to serve new construction on existing undeveloped lots should not be permitted except where there is an acceptable Class 7 sewage system and disposal area available and,

(i) the Director can be satisfied that a Class 4 or 6 sewage system cannot be installed with, if necessary, reasonable improvements to the site, or

(ii) the use of the holding tank is a temporary measure pending a reasonably anticipated extension of sewers, or

(iii) there is a prevalence of holding tanks in the area, or

(iv) the municipality accepts an arrangement to ensure continued Class 7 service.

(c) Class 5 sewage systems may be used;

(i) To solve existing pollution problems
(ii) To permit property owners to upgrade the standard of the sewage disposal system at an existing residence, providing the correction of the substandard system by installation of a Class 4 or Class 6 sewage system is impractical because there is no suitable area for such systems on the lot, or the cost makes it prohibitive.

(d) Before a Certificate of Approval is issued for a holding tank, the owner should have an agreement with a licensed Class 7 contractor for the disposal of the holding tank waste. A copy of this agreement should be provided to the authorizing office with the application for the Certificate.

5 CONSTRUCTION AND INSTALLATION

(a) A Class 5 sewage system must have a holding tank capable of withstanding the stresses to which it will be exposed and should have a life expectancy of at least 15 years. Sections 6 and 11 of 0. Reg. 374/81 prescribe the construction standards and specifications for holding tanks. Drawing 11.1.1 illustrates the functional aspects of a sewage holding tank.

(b) A holding tank is to be connected to the residential plumbing with a watertight connection. The resultant effect will be that, if the holding tank is full, further usage of the sewage system will cause the sewage to back up into the house fixtures.

(c) Holding tanks into which sewage flows by gravity will normally be vented through the connection to the building served, and thus to the building vent. Drawing 11.1.2 and 11.1.3 are illustrative.

(d) Where a Class 5 sewage system incorporates the pumping of sewage to the. tank, a vent is required on the tank. The tank must be equipped with a device or devices which will shut off the pump and lock it out of operation when the tank is full. So that sewage cannot be pumped out of the tank through the vent, if the pump shut-off fails to operate, the vent on the tank may incorporate a ball closure device. Otherwise, the vent pipe should be of sufficient height to overcome the maximum pressure that can be exerted by the pump. If there is fast reliable service from the sewage hauler, it may be possible to have the warning device and pump cut-off operated by the same switch. Drawing 11.1.4 is illustrative of such an installation.

(e) All Class 5 sewage systems will incorporate a warning device, usually suspended from the top of the tank, which will provide audible or visible warning when the tank should be emptied. A typical device would be a mercury float switch operated alarm system powered either by hydro or by batteries. The switch would be set to operate at the sewage level in the tank which, considering the daily sewage produced, and the number of days advance notice that must be given the sewage hauler will give adequate warning of the need for pump-out, without disruption to the activity

of the premise served. The alarm circuit would be connected to a device, located in the building, which would sound audible warning, e.g. a bell, and, at the same time, light a warning light. If the device is wired so that the light remains on after the audible alarm is turned off, it will be a continuing reminder until the sewage level in the tank is lowered by pump-out. Other forms of warning device, which achieve the same result and are reliable, can be accepted.

(f) If the manufacturer has specified handling and installation instructions, these should be followed by the installing contractor. This is especially important if the manufacturer has a guarantee associated with the purchase of the tank. Where no such instructions are given, normal construction practices should be followed to provide a stable foundation for the tank, supporting the tank bottom evenly over its length or, if appropriate, at specific loading points. Uneven settlement is to be avoided.

(g) If a tank is installed underground in a location where the groundwater at any time of year can rise around the tank, the water will exert an upward pressure on the tank. If this pressure at highest ground water level exerts a greater uplift force on the tank than the combined weight of the empty tank and soil overburden (if any) acting downward, the tank will "float" and the system will be disrupted. In such cases the tank must be "anchored" by some method to prevent floatation. Setting the tank on a concrete slab of sufficient weight to counteract floatation, with strapping holding the tank securely to this slab, is one method of preventing floatation.

(h) The Regulation permits the use of more than one tank to provide the overall minimum capacity of 9000 litres, providing such tanks. are interconnected in such a manner as will allow the sewage contained therein to flow between the tanks. The connection should permit complete emptying of the system by pump-out. While this permits the use of smaller prefabricated tanks, all such tanks must meet the requirements for holding tanks, and considerable care must be taken to ensure against uneven settlement or heaving which could disrupt the connection(s) between tanks. Where there is doubt that this can be achieved the installation of a single tank is to be preferred.

6 OPERATION

Section 11 of 0. Reg. 374/81 prescribes operating standards.

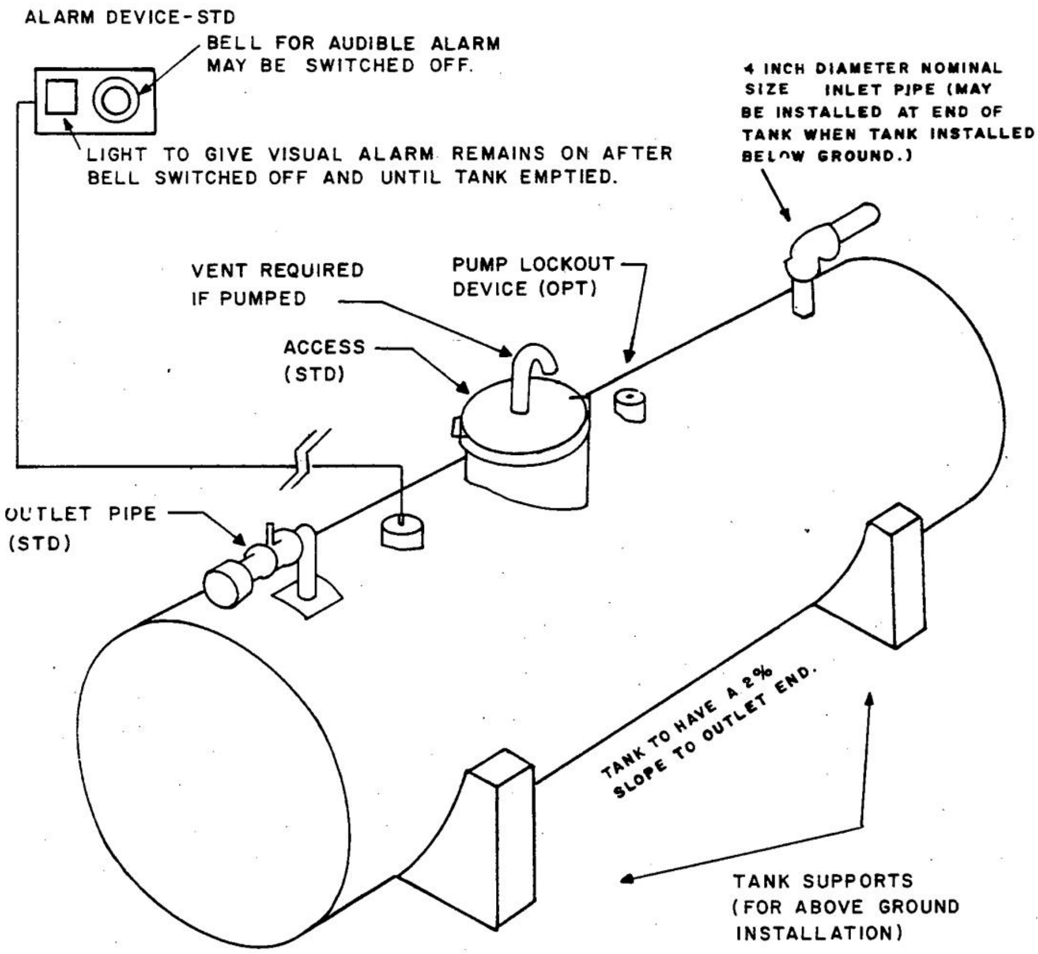
7 INSPECTOR'S RESPONSIBILITIES

(a) The inspector's responsibility is to determine if the proposed sewage system may be a future source of contaminant of the natural environment. This determination is based on a technical assessment as well as the judgement of the experienced inspector. Some factors to consider prior to the issue of a Certificate of Approval for a Class 5 sewage system are:

- (i) Is installation being undertaken by a licensed contractor?
- (ii) Has an agreement been made for removal of the waste by a licensed contractor? Is this a practical agreement? Has the contractor an approved disposal site?
- (iii) Is the capacity of the proposed tank adequate for the intended use and at least equal to the minimum required by regulation?
- (iv) Are there any municipal by-laws affecting the use of holding tanks?
- (v) Does the proposed arrangement of the tank, or more than one tank, meet the regulatory requirements? Is the tank of a type approved for use in Ontario or, if not, one meeting the same requirements. If the type of tank to be purchased is not known at the time of review of the application, the applicant should be aware of the need to purchase a tank of an approved type.
- (vi) Are there any special conditions that should be included in the Certificate, e.g. venting, protection against weather, including wind and waves if appropriate? Is there adequate protection against frost if intended for winter use, e.g. a means of draining the pipe leading to the tank if such lines are not frost protected?
- (vii) Is the proposed method of bedding the tank acceptable?
- (viii) Does the proposed Class 5 system have a satisfactory warning device?
- (ix) If evident from the application, will the tank be installed to slope to the pump-out pipe thereby ensuring complete dewatering? In an arrangement of more than one tank is this possible?

(x) If the tank is to be filled by a pump, does the proposal include a pump shut-off and lock-out device in addition to the warning device? Is there a vent with protection against vent overflow should the pump cut-off fail?

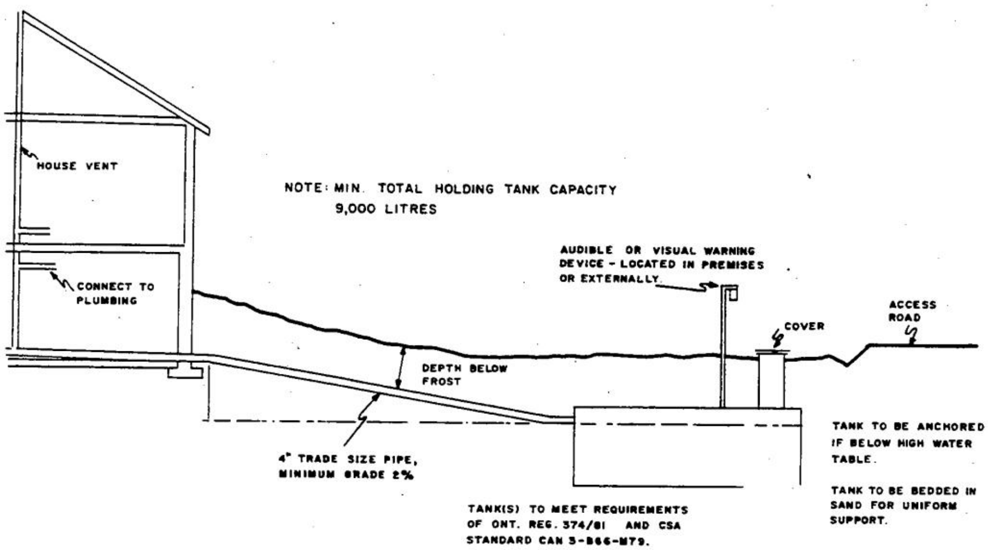
(b) Prior to issuing a Use Permit for the system, the inspector should ensure that the installation meets all the regulatory requirements, any special conditions required by the Certificate of Approval, and that the standard of workmanship is acceptable. A review of the points outlined in (a) is suggested although it is not an inclusive listing of points to review.



STD - STANDARD
OPT - OPTIONAL

FUNCTIONAL ASPECTS OF PROPOSED SEWAGE HOLDING TANK.

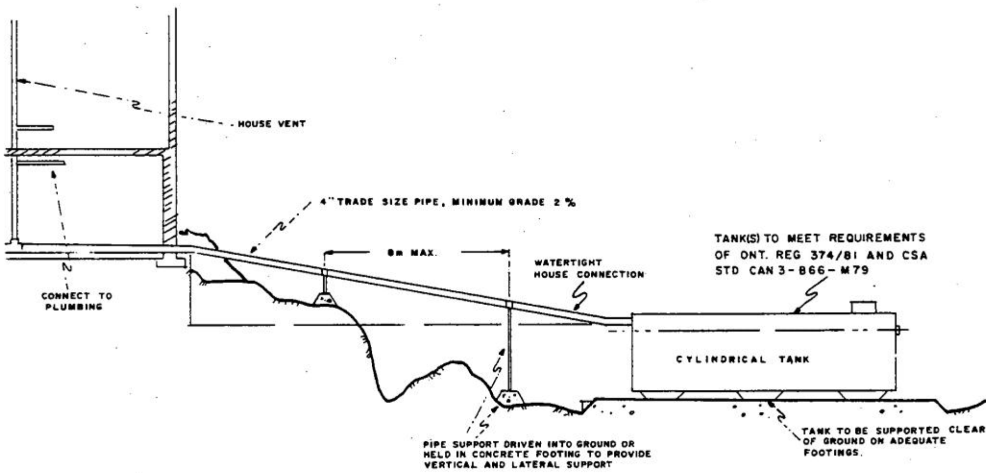
MINISTRY OF THE ENVIRONMENT	
CLASS 5 SYSTEM TYPICAL HOLDING TANK	
SCALE N.T.S.	
DRAWN BY J.B.M.	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 11.1.1



MINISTRY OF THE ENVIRONMENT

CLASS 5 SYSTEM
UNDERGROUND INSTALLATION
GRAVITY FEED

SCALE N.T.S.	
DRAWN BY J.B.M.	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 11.1.2

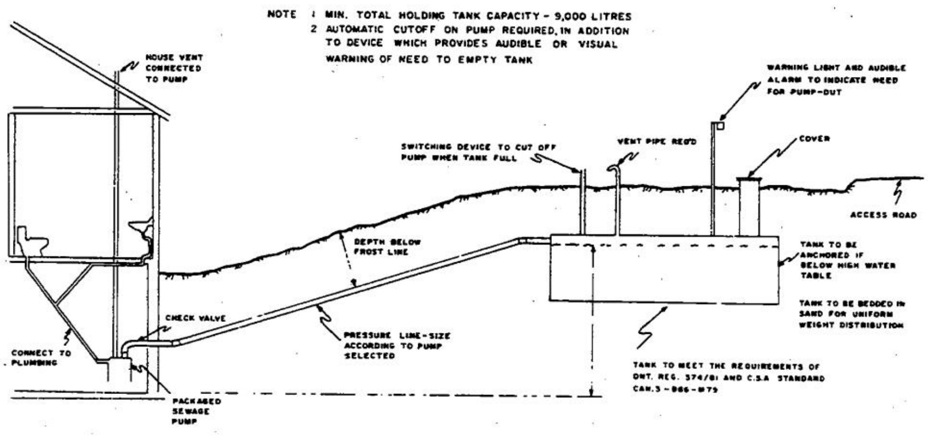


NOTE 1 MIN. TOTAL HOLDING TANK CAPACITY - 9000 LITRES
2 INSTALLATION FOR SUMMER OPERATION ONLY. FOR WINTER OPERATION PIPING AND TANK MUST BE INSULATED.

MINISTRY OF THE ENVIRONMENT

CLASS 5 SYSTEM
ABOVE GROUND INSTALLATION
GRAVITY FEED

SCALE N.T.S.	
DRAWN BY J.B.M.	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 11.1.3



MINISTRY OF THE ENVIRONMENT

CLASS 5 SYSTEM
UNDERGROUND INSTALLATION
PUMPED SYSTEM

SCALE N.T.S.	
DRAWN BY J.B.M.	DATE APRIL 1982
CHECKED BY R.A.W.	DRAWING NO. 11.1.4

12

CHAPTER 12

CLASS 6 SEWAGE SYSTEM

CHAPTER 12

CLASS 6 SEWAGE SYSTEMS

CLASS 6 SEWAGE SYSTEMS
PROPRIETARY AEROBIC TREATMENT PLANTS

1 GENERAL

(a) The purpose of this Article is to provide a general description of Class 6 sewage systems, in which proprietary aerobic treatment plants are used, and to outline the Ministry's requirements for design and operation of such systems. The orocedures used in the review of proprietary aerobic treatment plants for their acceptance for use within the Province are also included.

(b) Class 6 sewage systems are regulated under Part VII of the Environmental Protection Act, 1971.

(c) A Class 6 sewage system includes the propietary aerobic sewage treatment plant as defined in the Regulation, and all related parts and appurtenances associated with the operation of the plant and the treatment and disposal of the sewage. These include any pre-treatment or flow balancing tanks, pump chambers, compressors, power connections, controls, alarm systems, and the leaching bed together with any surrounding soil mantle constructed as part of the installation. All sewers and appurtenances are part of the Class 6 sewage system, although building sewers as defined in the plumbing code are regulated under that code (0. Reg. 647). For simplification the proprietary aerobic sewage treatment plant may be referred to elsewhere in this article as "the plant" or "the treatment plant".

(d) The complete sewage system is normally located entirely on the property occupied by the building or buildings it serves. If all or any part of a Class 6 sewage system is off that property the requirements of the regulation must be met respecting easements or ownership and operating responsibility.

(e) Class 6 sewage systems may serve single dwellings or serve a variety of residential and commercial uses. Some examples are:

   (i) A motel or resort having several motel units or buildings.

   (ii) A tent and trailer park.

(iii) A shopping plaza or-small industrial park. For such installations, a plan showing the occupancy, the facilities to be installed and the quantity and quality of the sewage to be treated, should be attached to the Application for Certificate of Approval wherever possible. If this information is not known, a condition could be considered for inclusion on the certificate that all information concerning installed sewage generating equipment and facilities be provided to the authority at the earliest opportunity.

(iv) A condominium establishment in which individual condominium units are privately owned, but where the association maintains responsibility for the jointly-owned property and utilities.

(v) A mobile home park in which the mobile home units are individually owned, but the property, and utilities remain under the ownership and responsibility of the owner of the park. To ensure adequate servicing and satisfactory guaranteed operation, an agreement should be made between the mobile home park owner and the municipality, which will provide for municipal responsibility for the continued satisfactory operation of the system should the owner default in any way. Agreements should be flexible and have regard for local conditions.

2 PRINCIPLES OF OPERATION

(a) Treatment plants in Class 6 sewage systems vary in shape and design but essentially consist of an aeration compartment or chamber in which oxidation of the sewage takes place, followed by a settling chamber where sewage is clarified prior to passing to the leaching bed for final treatment and subsurface disposal. Some tanks have a compartment for receiving the raw sewage before it passes to the aeration chamber.

(b) In the aeration chamber of some systems the sewage is kept agitated by the bubbling of air into the sewage, or by the action of paddles or propellers, and in these the oxygen from the air is dissolved in the sewage where it supplies oxygen to the aerobic bacteria for reduction of the BOO. In other types, discs mounted on a horizontal axis and partly submerged in the sewage are rotated so that their surfaces dip into and out of the sewage. A biomass containing

aerobic bacteria forms on the surface of the discs and oxygen for reduction of the BOD is obtained by direct contact with the air.

(c) Some form of overflow or pumping arrangement moves the sewage progressively from the aeration compartment to a settling compartment and thence from the tank to a leaching bed. Sludge from the settling compartment may be returned to the aeration compartment for further treatment and as a seed to facilitate rapid breakdown of the organic wastes. This transfer of sludge may be effected by pumps or by gravity, depending on the design. Sludge return by whatever means should be sufficient to maintain the mixed liquor suspended solids (MLSS) in the aeration chamber at an appropriate concentration to ensure oxidation of the sewage.

(d) Further reduction of BOD_5, suspended solids and bacteria, takes place in a leaching bed, and is primarily aerobic in nature. The leaching bed may be designed as a sand filter, or may be of the absorption trench type. Leaching beds for aerobic systems must comply with regulatory requirements and with the provisions for leaching beds outlined in Chapter 8, and any specific detail included in this article related to size and loading.

3 REVIEW AND ACCEPTANCE OF PROPRIETARY AEROBIC SEWAGE TREATMENT PLANTS.

(a) Approval for the installation of a proprietary aerobic sewage treatment plant of a type which has not been assessed and accepted by the Ministry for use in a Class 6 sewage system shall not be granted. The manufacturer should be advised to contact the Private Sewage Unit, Operational Services Section, Environmental Approvals and Project Engineering Branch. concerning the action to be taken to demonstrate the acceptability of the plant. All matters respecting application and acceptance will be arranged directly between the manufacturer and the Ministry. An exception may be made if the manufacturer is not in the Province and is represented throughout the Province by a single distributor or agent. A copy of this guideline will be made available to the applicant.

(b) The regulation requires that printed literature that describes the treatment plant in detail and provides complete instructions regarding its operation, servicing and maintenance requirements, shall be

supplied by the manufacturer or distributor. Copies of this literature should be supplied for evaluation together with any results of tests performed on the plant by a reputable qualified third party.

(c) The Ministry will evaluate all proprietary aerobic treatment plants proposed for use in Class 6 sewage systems and make recommendations as to their acceptability. Plants will be assessed considering:

(i) The probability of failure-- A more sophisticated and complex plant has a higher chance of failure occurring. Mechanical and electrical components, settling facilities, filters, the ability to withstand surges, etc., will be evaluated.

(ii) The consequences of failure on the environment and on the owner and his neighbours.--e.g. Will it operate as an adequate septic system on a temporary basis?

(iii) Performance.

- Does the plant oxidize the sewage to an acceptable degree?

- If the manufacturer's claims were achieved, would such operation be acceptable?

- What are the chances of achieving acceptable performance on a continuing basis?

- Does the plant qualify for use with the small leaching beds permitted in a Class 6 sewage system.

(iv) The design, installation and operating criteria of the plant and the system as proposed by the manufacturer or distributor. The basic requirements are set out in Section 5.

(v) Any limitation or restrictions which should be placed on the use of the plant or any of its components.

(d) A major part of the evaluation will be the examination of the results of tests which have been conducted by a reputable testing agency independent of the manufacturer. The test must be conducted on a

model of treatment plant that is ready for production. The decision to accept test results on a model of similar design, but different capacity, will be that of the Ministry. If test results are not available, or are not considered applicable, the manufacturer will be asked to subject a production model of his treatment plant to a standard test as specified by the Ministry, or to the equivalent of such test. If most information is satisfactory, but some questions remain, some additional testing may be required.

(e) Acceptance will not be recommended in any case where the proposal is an untested prototype or an outline proposal. In such cases, the company or individual will be instructed to undertake development work and testing until a system is developed for marketing on which a normal assessment can be undertaken.

(f) If the evaluation by the Ministry's Head Office is favorable, the matter will be referred to Regional Operations for comment.

(g) After the review is completed the agency (manufacturer or his agent) applying for acceptance will be advised of the results. Assuming the treatment plant is found acceptable for use in a Class 6 sewage system, a letter of acceptance for such use in Ontario will be forwarded by the Ministry. Part of the acceptance is an understanding that, in addition to compliance with the regulations, the manufacturer and his distributors or agents will comply with the terms and conditions in this guideline, and the revisions made from time to time to either the regulation or the guideline.
All agencies delivering the private sewage program will be advised by copy of the letter. The letter of acceptance will include any special conditions or features which form an integral part of the acceptance, and any limitations placed on the use of the system.

(h) Once a model is accepted, it will be the manufacturer's responsibility to provide those authorized as Directors for the purpose of approving Class 6 sewage systems with complete drawings, specifications and literature on the system, including copies of the format of the service contracts, warrantees, etc. In addition, all such literature is to be supplied to the owner and to anyone contracted to service the sewage system.

4 POLICY WITH RESPECT TO USE OF CLASS 6 SEWAGE SYSTEMS

(a) The Ministry's policy respecting the use of Class 6 sewage systems is contained in Chapter 15.

(b) Subdivision and severance proposals - A site examination of lots proposed in Applications for Subdivision or Severance will be undertaken to determine the suitability of each lot, in its natural state or with improvements, for the installation of a Class 4 or Class 6 sewage system based on the current regulatory requirements for the selected system. The choice of Class 4 or 6 as the sewage system on which the lot examination will be based is a local decision. The assessment should be based on the requirement for a 3bedroom house unless a larger structure is intended. Comments on this basis will be made to the office approving the subdivision or severance, e.g. the Ministry of Municipal Affairs and Housing, a Regional Municipality, a Committee of Adjustment or Land Division Committee. If a Class 6 sewage system is used in the assessment the treatment plant must be of a type accepted by the Ministry.

(c) Sewage system installation - Each proposal for installation of a Class 6 sewage system should be examined to ensure its acceptability respecting both the site and the suitability of the type of plant to the proposed use. Some important points are:

(i) The assessment of daily sewage flow must take peak daily and hourly flows into account. The selected treatment plant must have the capacity to handle both these peaks.

(ii) Sewage quality must be within the treatment capabilities of the plant. In some cases a form of pretreatment may be required.

(iii) As for any sewage system in which the final disposal is sub-surface, the site should be capable of absorbing the hydraulic load in the soil under and around the leaching bed without breakout, and use of the system should not impair the ground water in the area.

(iv) Servicing arrangements should be satisfactory to the Director.

5 DESIGN AND INSTALLATION CRITERIA FOR CLASS 6 SEWAGE SYSTEMS

(a) Proprietary aerobic treatment plants and their related components shall:

(i) meet the requirements of CSA Standard CAN3-B66 with respect to standards for materials, access, workmanship and construction methods and practices.

(ii) have a minimum daily working capacity, defined as the volume of sewage that can be given treatment in a 24 hour period to the standards on which the acceptance was based, of not less than the sewage flow from the dwelling served, or the sewage flow determined from Appendices 9.3.1 and 9.3.2, or as computed by other means and agreed to by the Director. The design daily sewage flow from dwellings should not be less than 1100, 1600 and 2000 litres for dwellings of 2 bedrooms or less, 3 bedrooms and 4 bedrooms respectively. Add 300 litres per day for each bedroom in excess of 4.

(iii) be of a type that will handle the expected peak flows and shock loads, and that, in operation, will not be upset by the quality of the sewage to be treated.

(iv) produce an oxidized effluent.

(v) maintain a minimum of 2 mg/L of dissolved oxygen in the aeration compartment, if operating on the principle of dissolved oxygen.

(vi) if it is a system operating on the rotating biological disc or similar principle involving contact of the biomass with air, provide a disc area so that the daily loading of sewage will not be in excess of 1.25 kg of BOD_5 per 100 m^2 of disc area, or a hydraulic loading in excess of 45 L per /m^2 of disc area.

(vii) include a failure warning system with a sound alarm located so as to be audible to the building occupants.

(viii) be installed in a manner providing protection against damage due to frost or to uplift pressure from high ground water, particularly when the tank is pumped during servicing.

(ix) be capable of being secured against unauthorized access to the tank's interior.

(b) Leaching beds for Class 6 sewage systems may be of the absorption trench type or filter type. Design and construction should meet the requirements of the regulation and of the guidelines contained in Chapter 8 of this Manual.

(i) The requirements for distribution pipe in a leaching bed of the absorption trench type shall be as shown in Table 5 of 0. Reg. 374/81 for residences, or otherwise as required by the formula L (metres) = QT/300 where Q is the design daily sewage flow in litres and "T" is the design percolation time of the soil in which percolation of the sewage below the absorption trench will take place.

(ii) The filter type of leaching bed shall not be used with a sewage system having a daily sewage flow in excess of 10,000 litres. Individual filters shall not exceed 50 m^2 in surface area. Filter beds serving private dwellings shall be sized in accordance with tables in the Regulation. Otherwise, they shall be sized so that the loading on the surface area shall not exceed 150 $L/m^2.d$ for systems of daily sewage flow not exceeding 6000 litres, or 100 $L/m^2.d$ if the daily sewage flow exceeds 6000 litres. A typical filter bed is shown on Dwg. 8.5.1.

(c) The design and construction of sewers and appurtenances, dosing chambers, etc, for part of a Class 6 sewage system shall meet the requirements of the regulation and the appropriate corresponding guidelines for septic tank systems outlined in Chapter 9.

6 CERTIFICATES OF APPROVAL AND USE PERMITS

(a) A Certificate of Approval is required for the construction, installation, establishment, enlargement, extension or alteration of a Class 6 sewage system. The Director issuing the Certificate should follow the procedures outlined in Chapter 3, Article 3. Prior to issuing the Certificate the Director must ensure that the requirements of the regulation and the intent of the guidelines are followed, or have reasons which will stand up to an appeal where departures are made. Some of the more important points to consider before approval are:

(i) is the treatment plant of a type accepted for use in Ontario?

(ii) is the plants capacity and method of operation correct for the expected sewage flows, daily flow pattern, peak flows and quality of sewage. The plant manufacturer should be prepared to provide sufficient data to assure the Director on such points.

(iii) are the site conditions suitable? While the smaller leaching beds acceptable with Class 6 sewage systems enable them to overcome space problems, the hydraulic load on the soil is the same as in other systems under similar circumstances. Dispersal of this liquid in the soil without breakout must be achieved.

(iv) if a filter type bed is proposed does the filter material from the proposed source meet the regulatory requirements?

(v) how is servicing proposed? If daily sewage flow exceeds 4500 L a written agreement for servicing by a contractor is required. His licence should be endorsed authorizing him to service and maintain that type of plant, or the Director issuing the Certificate of Approval should be convinced in other ways of his qualifications. For smaller sewage systems the work may be done by a contractor (as above) or the owner if he can convince the Director of his ability to do the work (e.g. letter from the manufacturer or agent re training completed). All those doing this work must possess and follow the operating and maintenance instructions.

(vi) are there adequate plans and specifications presented with the application? Any attachments to the Certificate which form the basis of its approval should be referred to in the body of the Certificate.

(b) If it is desired to ensure that subsequent owners are aware of their responsibilities under the regulation respecting operation of the system, a condition (see below) could be included in the Certificate of Approval, together with a requirement that a copy of the Certificate of Approval be registered on Title of the property. These steps are recommended for all Type A Class 6 sewage systems. If registration on Title is required, the condition may also require that proof of registration be provided to the Director before the issue of a Use Permit. A suggested wording of the condition is as follows:

“Ontario Regulation 374/81 prohibits the operations of a Class 6 sewage system having a daily sewage flow exceeding 4500 litres unless there is a written agreement between the owner or operator of the sewage system and a person licensed under Part VII of the Act, whose licence has a condition authorizing him to service and maintain the type of. proprietary aerobic sewage treatment plant installed in the sewage system, for the servicing and maintenance of the plant and its components with a frequency necessary to ensure its proper operation in accordance with its design, specification, and operating instructions. The owner shall include information respecting the type of sewage system installed, and the maintenance requirements of the regulation, in any Offer of Purchase or Sale."

(c) The plant manufacturer's guarantees or warrantees may cover only the treatment plant and its accessories, or may be extended to cover other parts of the Class 6 sewage system. The owner (and, indirectly, the Director) has an interest in ensuring that these guarantees or warrantees will not be prejudiced in any way by the construction of the sewage system as a whole. The plant manufacturer has an interest in overall system design of the sewage system to ensure compatibility of his product with the intended use, and, if he or his agent are not the sewage system installer,

should be concerned that no work is done by others that would prejudice the guarantees. If the Director feels it warranted, as it may be in larger Class 6 sewage systems, he may require that a written statement by the manufacturer or his agent indicating satisfaction that the selected plant is compatible with the intended use and the overall system design, be included with the Application for Certificate of Approval. If the Director is concerned about the post construction aspects respecting the guarantees or warrantees, a clause, similar to the following, may be added to the Certificate.

"It is a condition of this Certificate that, after construction of the sewage system is complete, the manufacturer of the treatment plant, or his authorized agent, certify to the Director, in writing, prior to the issue of a Use Permit under Section 67 of The Act, that the system has been constructed/installed/altered/repaired! extended (select as appropriate) to his satisfaction and without prejudice to the service contract and any guarantee or warranty offered by the manufacturer."

(d) The requirement and procedures respecting Use Permits are contained in section 67 of the Act and in Chapter 3, Article 4. A Use Permit is issued by the Director on the satisfactory completion of the installation authorized by and described in the Certificate of Approval and its attachments. Section 64 of the Act requires that a new Certificate of Approval be obtained for any changes to the installed system or to the building(s) served if the use of the building(s) so changed is likely to affect the operation or effectiveness of the sewage system. This applies to all installations, but is particularly important in the case of commercial installations, such as those referred to in section 1(e). For example, in a shopping plaza or small industrial park, a change of occupancy can alter both the quantity and quality of the sewage.

(e) Each office issuing Use Permits for Class 6 sewage systems will maintain a separate list for each make and model, number of the locations in which the units were installed and the Use Permit No. and date of issue.

7 OPERATING CRITERIA

(a) The operating and servicing requirements are outlined in section 12 of 0. Reg. 374/81.

(b) The Ministry may require the manufacturer to periodically submit such performance reports or conduct such tests as are considered necessary for the compilation of performance data on field installations of any systems.

8 POST INSTALLATION MONITORING AND INSPECTION

For systems accepted for use in Ontario under the procedure outlined in paragraph 3, the Ministry may require specific post-installation action by the manufacturer or his agent and by personnel of the Ministry or of agencies responsible for delivery of the program under Part VII of the Act. These requirements may be. varied, if necessary, to take into account differences in the equipment. A typical monitoring program would include the following.

(a) Operating, servicing and maintenance in accordance with the manufacturer's recommendations and the requirements of subsections 12(3) to 12(7) of 0. Reg. 374/81. The frequency of inspection and servicing will be dictated by the requirements of the particular treatment plant. The manufacturer or his agent, if not carrying out the servicing, should be cognizant of any operating problems and the action taken by the individual or firm carrying out this work.

(b) The servicing contractor would maintain, for each unit for which he is responsible, a log of the work performed including, but not limited to, the date of the inspection and details of the servicing and maintenance provided. The log shall be maintained at his office and available for review by representatives of the office responsible for Class 6 sewage systems.

(c) A spot check for dissolved oxygen in the aeration tank conducted by, or on behalf of, Ministry personnel. The number inspected in any year in relation to the number of that make and model installed should be based on the number required for a statistical probability analysis using a completely random basis for the selection of units

to be tested and the time of year for inspection. Should the number of a particular model installed be not more than 50, advice on the number to be tested and method of testing should be obtained from the Ministry. Where 51-150 are installed, the number inspected for research evaluation would be 3. The program can be used for multiples of 100. i.e. for 151-250 installations, 6 units should be tested. The test results should lead to action as shown hereunder based on inspecting 3 units:

(i) if 3/3 show positive DO values - no further testing is required.

(ii) if 2/3 show zero DO - select, at random, an additional 7 units and measure DO.

- If out of these 7, 1 (or more) shows zero DO (i.e. 2/10 of total) a more intensive study is required - notify Head Office.

- if all 7 show positive DO (i.e. 9/10 of total), no further testing is required.

Note: The above computation should be proportionaly increased if the number of installations require the inspection of 6 units, 9 units, etc.

(d) Field personnel should conduct a spot check of representative installations of each type of equipment to determine if the servicing is being conducted as required by the Regulation. Such checks are most applicable in the early period of use of any new type of system.

9 Acceptance of a make and model of Class 6 sewage system under the above terms may be revoked, or modifications to new units or installed units may be required, if experience with the equipment so justifies. In addition, where future policy requires that modifications or improvements, such as the addition of a device to remove nutrients, be made to Class 6 sewage systems in general, the Ministry may require that they be made to any equipment not yet installed.

13

CHAPTER 13

HAULED SEWAGE AND CLASS 7 SEWAGE SYSTEMS

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CHAPTER 13

HAULED SEWAGE AND CLASS 7 SEWAGE SYSTEMS

HAULED SEWAGE

1 GENERAL

(a) Hauled sewage is defined in the Regulation as sewage that is:

(i) not finally disposed of at the site where it is produced and is not carried away by a sewer approved under the Ontario Water Resources Act and

(ii) stored or retained at the site where it is produced for periodic collection, handling, treatment, transportation, storage or processing prior to final disposal at a place other than where it was produced,

and includes sewage that is removed from a sewage system for purposes of cleaning or maintaining the system but does not include the sewage in a sewer collection system that transfers the sewage from the site where it is produced to a Class 4, 5 or 6 sewage system located on a separate property."

(b) Hauled sewage is most commonly the waste pumped from a septic tank when it is periodically cleaned. Such waste is a mixture of the sludge, scum and sewage in the tank and may be referred to as "septage". For purposes of this guideline "septage" shall also include the accumulated sludge removed from proprietary aerobic treatment plants. Hauled sewage also includes waste pumped from other classes of sewage systems, particularly that from sewage holding tanks. A truckload is normally either septage or holding tank waste, but may be a mixture of the two.

(c) Because hauled sewage is a mixture of untreated and partly treated sewage it presents a hazard to health if not disposed of in a proper manner.

2 HAULED SEWAGE QUANTITIES

(a) There are an estimated 750,000 private sewage systems in Ontario serving more than 2.5 million people and treating about 650,000 cubic metres of sewage daily. The majority are septic tank systems, while a smaller number are Class 5 and Class 6 sewage systems. Maintenance of these systems generates about 1,000,000 to 1,500,000 cubic metres of hauled sewage annually.

(b) The periodic removal of accumulated sludge and scum from septic tanks .is necessary to ensure the proper functioning of the tank and to prevent clogging of the leaching bed. The period between pumpouts varies according to use. As the sludge depth and scum accumulation increase, the liquid volume and retention time decrease. Scouring of the solids will result if the tank is not pumped. Tanks should be inspected for sludge accumulation at least once every two years.

(c) Sludge must be removed from Class 6 sewage systems in accordance with the manufacturer's recommendations or as determined by main tenance inspection.

3 HAULED SEWAGE CHARACTERISTICS

(a) General - In a septic tank there are clear chemical distinctions between the sludge and the supernatant. Ministry of the Environment Research Report, W63, "Accumulation Rate and Characteristics of Septic Tank Sludge and Septage" provides data illustrating the distinction. The withdrawn septage represents about a 50/50 ratio of settled sludge and supernatant. Data. In the report was obtained from three locations and is reproduced in Appendix 13.1.1 as Tables 1 and 2.

(c) Septic Tank Wastes - The chemical and physical properties of sept-age depend on many factors such as family habits, the size and design of septic tanks and the frequency of pumping of the tank. The concentration of contaminants in septic tank septage at three specific Ontario locations as outlined in MOE Report W63 is shown in Table 3 of Appendix 13.1.1. A comparison of the results of that study with data from the "New England Guidelines for Septage Disposal"

is in Table 4 of the Appendix. The typical characteristics and metal concentrations shown in Tables 5 and 6 of Appendix 13.1.1 (reproduced from EPA (U.S.) sources) can be taken as representative of septage from domestic sources.

(c) Holding Tank Waste - There is little data available on the characteristics of holding tank waste. It will vary in strength depending on the use of the building. In general, waste from Class 5 sewage systems serving houses or cottages may be four times as strong as normal domestic sewage due to lower water usage.

(d) The disposal methods outlined in Article 3 may be taken as referring to all forms of hauled sewage unless otherwise stated. In a particular circumstance, however, consideration can be given to the differing characteristics between septage and holding tank waste.

(e) When the hauled sewage is from a non-domestic source any special characteristics of the waste should be considered before determining the most acceptable and practical disposal method.

TABLE 1

CONCENTRATION OF CONTAMINANTS IN SEPTIC TANK SLUDGE (AVERAGE DATA)[1)]

Location of SepticTank	Hawkestone	Farm	Orillia House	Hospital	Whitby Experim.	Station
Compartment of SepticTank	I	II	I	II	I	II
Total Phosphorus	610	18	170	160	100	135
Soluble Phosphorus	1.7	2.8	33.0	19.0	23.5	6.1
Total Solids	23,350	620	33,550	28,495	35,400	27,070
BOO_5	6.000	2380	13,500	15,000	12,000	4,900
TOC	N.T.	100	N.T.	10,400	3,525	2,545
COD	N.T.	N.T.	35,600	44,200	20,000	17,050
pH	N.T.	8.4	6.8		6.2	6.8
Ammonia (as N)	19	22	88	92	47	26
Total Kjeldahl (as N)	2,200	170	630	650	900	298
Nitrite (as N)	0.01	0.01	0.02	0.05	0.01	0.02
Nitrate (as N)	0.98	0.1	0.1	0.1	0.1	0.1
Chlorides (as Cl)	50	57	78	83	156	139
Sulfates (as SO_4)	28	19	21	17	33	51
Aluminium (as A)	5.3	0.29	14	4	10	7.9
Iron (as Fe)	160	0.75	50	70	380	158
Calcium (as Ca)	66	22	56	82	132	153
Magnesium (as Mg)	10	6	41	36	34	8
Sodium (as Na)	55	53	89	82	64	61
Potassium (as K)	22	20	26	28	16	10
Hardness (as $CaCO_3$)	N.T.	N.T.	308	352	470	432
Alkalinity (as Ca CO_3)	N.T.	N.T.	2,070	2,660	704	1,254
El. Conductivity(umho/cm)	NT.	N.T.	1,600	1,650	N.T.	1,750
Total coliform org/100ml	$0.9x10^6$	$0.42x10^6$	$16x10^6$	$1.6x10^6$	$99.0x10^6$	$16.0x10^6$
Fecal coliform org/100ml	$0.9x10^6$	$0.11x10^6$	$6.9x10^6$	$0.58x10^6$	$7.8x10^6$	$0.6x10^6$

1. All data, except on pH, el. Conductivity and coliform organisms are given in mg/l
2. N.T. - not tested.

TABLE 2

CONCENTRATION OF CONTAMINANTS IN SEPTIC TANK SUPERNATANT (AVERAGE DATA)[1)]

	CONCENTRATION OF CONTAMINANTS					
Location of SepticTank	Hawkestone	Farm	Orillia House	Hospital	Whitby Experim.	Station
SepticTank of Compartment	I	II	I	II	I	II
Total Phosphorus	24.0	19.2	17.0	15.0	10.0	2.4
Soluble Phosphorus	3.6	15.8	12.0	12.0	5.3	1.4
Total Solids	1100	630	1695	840	1700	665
Suspended Solids	400	80	760	65	147	30
BOD_5	260	74	300	160	110	34
TOC	N.T.2)	N.T.	555	250	65	18
COD	N.T.	N.T.	1424	448	315	75
pH	7.7	7.7	7.3	7.2	7.2	7.
Ammonia (as N)	160	141	56	68	8.7	10.3
Total Kjeldahl (as N)	210	153	85	75	18.7	14.7
Nitrite (as N)	0.01	0.01	0.03	0.02	0.04	0.39
Nitrate (as N)	0.44	0.1	0.1	0.1	0.17	0.23
Chlorides (as Cl)	100	100	165	98	94	96
Sulfates (as SO_4)	50	41	41	40	76	80
Aluminum (as Al)	4.0	0.17	0.6	0.14	0.82	0.14
Iron (as Fe)	3.9	1.0	1.3	0.6	0.83	0.80
Calcium (as Ca)	60	50	61	55	106	111
Magnesium (as Mg)	7.0	5.0	24	33	15	15
Sodium (as Na)	71	60	93	76	45	46
Potassium (as K)	41	41	20	24	5	5
Hardness (as $CaCO_3$)	88	88	252	247	358	370
Alkalinity (as $CaCO_3$)	680	673	534	539	260	257
El. Conductivity(umho/cm)	1700	1775	1240	1380	922	956
Total coliform org/100ml	$0.46x10^6$	$0.38x10^6$	$3.3x10^6$	$2.6x10^6$	$3.0x10^6$	8.1x10
Fecal colifonn org/100ml	$0.41x10^6$	$0.41x10^6$	$1.9x10^6$	$1.08x10^6$	$065x10^6$	$0.36x10^6$

1. All data, except on pH, el. Conductivity and coliform organisms are given in mg/l

2. N.T. - not tested.

TABLE 3

Concentration OF CONTAMINANTS IN SEPTIC TANK SEPTAGE

(average data – all except pH expressed in Mg/L)

Location of SepticTank	Hawkestone Farm Toilet, waste only	Orillia Hospital House Toilet, bath and Kitchen waste	Whitby Experim Station Toilet, bath, kitchen and laundry waste
Total Phosphorus	281	100	96
Soluble Phosphorus	6	22	13
Total Solids	10,780	18,610	17,136
BOD_5	2,747	7,810	5,496
TOC	Not tested	Not tested	1,660
COD	Not tested	21,450	9,490
pH	7.0 - 8.7	6.8 - 7.3	6.2- 7.4
Ammonia (as N)	89	77	27
Total Kjeldahl (asN)	1,072	390	416
Nitrite (as N)	0.01	0.03	0.16
Nitrate (as N)	0.58	0.10	0.15
Chlorides (as Cl)	77	103	122
Sulfates (as SO_4)	37	29	57
Aluminium (as Al)	3.5	6.7	4.9
Iron (as Fe)	72	31	173
Calcium (as Ca)	59	60	120
Magnesium (as Mg)	8	35	23
Sodium (as Na)	61	86	54
Potassium (as K)	32	24	10
Hardness (as $CaCO_3$)	Not tested	293	413
Alkalinity (as $CaCO_3$)	Not tested	1,465	488
Total coliform org/100 ml	$0.63x10^6$	$8.4x10^6$	47×10^6
Fecal coliform org/100 ml	$0.55x10^6$	$3.7x10^6$	3.7×10^6

TABLE 4

CONCENTRATION OF SOME CONTAMINANTS IN DOMESTIC SEPTAGE AS

COMPARED WITH LITERATURE DATA(values in mg/l except pH)

Contaminant	Ontario Study	New England Guide lines For Septage Disposal (7)
Total Phosphorus (as P)	96 - 281	150 – 275
Total Solids	10,780-18,610	13,781 – 130, 475
BOD_5	2,747 – 7,810	2,083 – 6,100
COD	9,490 – 21,450	24,700 – 57,000
Ammonia	27-89	72 -150
pH	6.2 – 8.77	4.2 – 9.0

TABLE 5
CHARACTERISTICS OF HAULED SEWAGE
FROM SEPTIC TANKS (SEPTAGE)
(All values in mg/L except where noted)

Parameter	EPA Mean Conc.	Minimum Reported	Maximum Reported
Total Solids	40,000	1132	130,475
Total V.S.	26,000	4500	710,402
Total S.S.	15,000	310	93,378
Volatile S.S.	18,100	3660	51,500
BOD_5	5,000	440	78,600
COD	45,000	1500	703,000
TOC	15,000	1316	96,000
1KM	600	66	1,900
NH_3-(N)	150	6	380
NO_2	0.7	0.1	1.3
NO_3	3.2	0.1	11
Total P	150	20	760
$P0_4$	64	10	170
Alkalinity	1,020	522	4,190
Grease	9,561	604	23,368
pH(units)	6-9	1.5	12.6
LAS	150	110	200

*Note: Reproduced from a paper entitled "SEPTAGE DISPOSAL IN WASTEWATER TREATMENT PLANTS" prepared for U.S. EPA by Ivan A. Cooper and Josph W. Rezek and presented at the National Sanitation Foundation's 3rd National Conference on Individual On-Site Wastewater Systems at Ann Arbor, Michigan, November 7, 1976. Reference in the Table, as it appears in the paper, have been omitted.

TABLE 6

METAL CONCENTRATIONS IN SEPTAGE*
(All values in mg/L)

Metal	EPA Mean Conc.	Minimum Reported	Maximum Reported
Al	50	2	200
As	0.1	0.03	0.5
Cd	0.5	0.05	10.8
Cr	1.0	0.3	3.0
Cu	8.5	0.3	34
Fe	200	3	750
Hg	0.1	0.002	4.0
Mn	5.0	0.5	32
Ni	1.0	0.2	28
Pb	2.0	1.5	31
Se	0.1	.02	0.3
Zn	50	33	153

*Note: Reproduced from a paper entitled "SEPTAGE DISPOSAL IN WASTEWATER TREATMENT PLANTS" prepared for U.S. EPA by Ivan A. Cooper and Joseph W. Rezek and presented at the National Sanitation Foundation's 3rd National Conference on Individual On-Site Wastewater Systems at Ann Arbor, Michigan, November 7, 1976. References in the table, appearing in the paper, have been omitted.

CLASS 7 SEWAGE SYSTEMS GENERAL

1 GENERAL

A Class 7 sewage system is a hauled sewage system consisting of the works, installations, equipment, operations and land used for the collection, handling, treatment, transportation, storage, processing and disposal of hauled sewage. It does not include the tanks (class 5 sewage systems) on the site where the sewage is produced; nor does it include a sewage works approved under Section 42 of the OWR Act, or a waste disposal site for which a Certificate of Approval has been issued under Part V of The Act, although either-may be used as a hauled sewage disposal site.

2 AUTHORITIES

There are other Ontario Ministries with an interest in any program involving the disposal of hauled sewage. The Ministries with a major interest are:

(a) Ministry of the Environment - The Environmental Protection Act, 1971, and the Regulation made under Part VII of that Act, have established a system for the control of the operations of class 7 sewage systems by means of licensing, certificates of approval, permits, fees and records. In most parts of Ontario, administration and approval of all activities under Part VII of the EP Act, except licensing, are the responsibility of the local Medical Officer of Health under formal agreements.

(b) Ministry of Health - The Public Health Act provides for ensuring that the condition of any premises, street or public place, or the disposal of sewage, trade or other waste, garbage or excrementious matter, is not a nuisance or injurious to health.

(c) Ministry of Agriculture - This Ministry's concern is with the quantity and quality of hauled sewage placed on agricultural land as a source of crop nutrient or soil conditioner in order to safeguard human and animal consumers and the long-term productivity of agricultural lands.

3 LICENSING AND CERTIFICATES OF APPROVAL

(a) Section 61 of the EP Act states: “No person shall engage in the business of storing, hauling or disposing of sewage from a sewage system without having first obtained a license issued by the Director."

(b) The license required by the hauler is obtained from the Ministry *of* the Environment upon the recommendation of the Health Unit in accordance with the procedures in Chapter 3, Article 2. An applicant may be required to pass an examination if required by the Director as authorized by the Regulation. The license merely allows the hauler to engage in the business of hauling sewage. It is not an authorization to carry out a specific task of hauling and disposing of sewage. These tasks require a Certificate of Approval from the local authority under Part VII (see Sections 3.3.4, 3.3.8 and 3.4.3).

(c) The Ministry of the Environment may revoke or suspend a license, or refuse to renew a license, on the recommendation of a Health Unit, providing the situation so warrants. This may be where the terms and conditions of Certificates of Approval are not followed or where malpractice is serious or repeated. A recommendation for revocation or suspension should provide written substantiation.

(d) Applications for Certificates of Approval - Each operation using a disposal site must be approved on a Certificate of Approval and Permit to Operate (see Ch. 3 Art. 3 Sec 4 and App. 3.3.2). An application, and resulting Certificate and Permit may cover more than one site. The application should be forwarded to the Health Unit or District Office in authority and should provide as much information regarding the proposed use of each site as is required by the approving authority such as:

  (I) the estimated quantity of seepage and/or holding tank waste to be disposed of at each site;

  (ii) the time of year and duration of disposal operation;

  (iii) agreement in writing to the use of the site for this purpose from the office responsible for the operation of the sewage treatment plant or landfill site, or from the property owner;

(iv) the method of disposal and the equipment to be used.

(e) Certificate of Approval and Permit - Subsequent to review of an application and an inspection of the disposal site(s) the approving authority shall issue a Certificate of Approval covering each disposal site found acceptable and a Permit to Operate prior to the start of actual operations. (see Ch. 3 Art 3, Sec 9(b)). The Certificate should include a statement covering:

(I) any modifications to the application;

(ii) conditions required by the approving authority;

(iii) any limitation to the quantities to be disposed of or the timing or method of disposal at each site;

(iv) in the case of a site used for land application, any requirement for staking of the area within which hauled sewage will be spread in order to maintain the required clearances.

4 REPORTING

An established Class 7 sewage system contractor or a person holding a license for the operation of a Class 7 system shall:

(a) keep daily records of:

(I) the premises from which sewage is collected and the amounts of sewage collected there from, and

(ii) the disposal site or disposal sites at which the sewage is discharged or disposed of and the amounts of sewage discharged or disposed of at those sites.

(b) Submit a report in writing to the Director on or before the 1st day of February of each year summarizing the information recorded above for the previous calendar year and reporting on such other information as the Director may require.

5 HAULAGE EQUIPMENT

The Regulations made under the Environmental Protection Act establish standards for the operation of a Class 7 sewage system. In addition, the following guidance is given to inspectors with regard to some of the equipment used:

(a) Piping must be watertight; the installation should be in conformance with the requirements of plumbing regulations.

(b) Hoses should be flexible, lightweight, rugged, pressure resistant, resistant to abrasion and smooth; a reinforced rubberized hose (3' diameter) best meets these features.

(c) Fittings should be watertight, easy to assemble and disassemble and capable of being fitted with locks to prevent misuse.

(d) Valves must be rugged and able to withstand all weather conditions.

(e) Vehicles and equipment must operate within acceptable noise levels; odours must be kept to a minimum; no spillage should occur during transfer;

(f) Some form of metering and/or control to measure the quantity of sewage hauled and delivered is required.

HAULED SEWAGE DISPOSAL

1 DISPOSAL PRACTICES

In the past, the major objection raised concerning septage disposal to a water pollution control plant (WPCP) was the questionable effect of this material on the plant operation. The major concern about the disposal of hauled sewage on land was the possible health hazards that might result. Both of these were legitimate concerns as there was no central control authority and no regulation or guideline to ensure that a consistent approach was made in solving disposal problems. This guideline has been prepared to set a provincial standard of practice. Together with the control obtained by the licensing of haulers and the issuance of Certificates of Approval for each land disposal site, it should provide a uniform approach. Although other methods of disposal are being investigated by agencies in the United States and Canada, only three methods have received serious consideration in Ontario. These are:

(a) disposal to a WPCP;

(b) disposal to a waste stabilization pond;

(c) application to land as a crop nutrient or for disposal by:

   (i) direct spreading or dumping from the haulage truck without any pre-treatment;

   (ii) indirect methods in which the sewage is treated prior to placing on the land.

2 DISPOSAL TO A WPCP

(a) General - The acceptability of this means of disposal depends on several considerations including:

   (i) the quantity of hauled sewage in relation to the normal flow of sewage to the plant;

   (ii) the quality of the hauled sewage if from other than a domestic source (eg. restaurant holding tank);

(iii) any special facilities required for receipt of the septage so that its addition to the normal sewage flow is controlled as to quantity or the time of day that the transfer is effected;

(iv) acceptance of trucks delivering hauled sewage to a plant if the route means driving through residential areas.

(v) the factors outlined in appendix 13.3.1 which should be considered before hauled sewage is accepted for treatment at a WPCP. Both those approving Class 7 systems and those operating the plant should be familiar with Appendix 13.3.1.

(b) Quantity for Disposal - Each proposal for disposing of hauled sewage at a WPCP must be examined by the authority responsible for the operation of the plant. Plants operating at or near capacity should not be considered except for emergencies. For plants operating below hydraulic and aeration capacity, the treatment process should not be disrupted if the hauled sewage added does not exceed 2% of the average daily design flow. During periods of low flow the hauled sewage portion of flow might be higher without adversely affecting the plant.

(c) Special Facilities - It may be necessary at some plants to construct special facilities so the hauled sewage may be fed to the plant at the most advantageous point and time. Among the facilities to be considered are:

(i) A tank to hold the hauled waste until sufficient plant capacity is available to treat it (e.g. during the night). It is desirable to provide a mixing device in the tank to keep the solids from settling. The tank should be positively vented.

(ii) A wash down facility to wash any spillage which may occur and to clean the trucks if necessary.

(iii) A weather protected area for transferring the load from the truck. This will permit winter operations.

(iv) A suitable means of transferring the stored sewage to the most appropriate point of the plant for treatment; Appendix 13.3.1 outlines alternative methods.

(d) COSTS

From a volume standpoint treating hauled sewage at WPCP is expensive. This is true *of* septage in particular. Its organic strength results in treatment costs for aeration which may be some fifteen to twenty times that of a similar volume of normal strength municipal sewage. However, if introduced during diurnal low flow periods, the only added costwould be related to sludge handling. Because the solids content of the sludge removed from a digester is approximately double that of septage delivered to the plant the added volume of sludge removed will be about half, or less, of the volume of septage delivered.

3 DISPOSAL TO A WASTE STABILIZATION POND

(a) The use of an existing municipal waste stabilization pond to treat septage is impractical unless relatively small quantities are involved. This applies more to septage than to holding tank waste because of the former's greater organic load. This loading is such that ,a waste stabilization pond receiving 4500 litres of septage per day, and designed on the basis of treating 22.5 Kg of BOD_5 per hectare per day, would be equivalent in size to one receiving normal sewage from a population of 250 people. If disposal to a waste stabilization pond is permitted, the septage should be introduced via a manhole on the sewerage system adjacent to the pond to provide for dilution of the septage with regular sewage before ft reaches the pond.

4 APPLICATION ON LAND

(a) Application of hauled sewage on land is an alternative to its disposal at a municipal treatment plant or waste stabilization pond. It may be the only practical solution in some areas. Hauled sewage may contain many pathogenic bacteria and viruses and recognition of its potential hazard to health is essential when selecting the method *of* application. To guard against health problems it is important to follow, as a minimum, the guidelines contained hereunder.

(b) Land application includes such methods as surface spreading, sub-surface injection, spray irrigation, trench and fill and the use of sanitary landfill sites. The methods discussed in these guidelines fall into two main categories:

(i) Direct application where the hauled sewage is placed directly on the land without any pretreatment. The sewage may be placed directly on the surface or in furrows which are immediately covered, or may be injected into the soil.

(ii) Indirect application where the septage is pretreated prior to disposal on the land. The pretreatment usually involves storing the septage in a holding pond to allow the solids to settle out and then pumping the supernatant on to the land.

(c) Some of the more important factors to be considered in evaluating a potential land disposal site are:

(i) The general topography of the area.

(ii) Its proximity to surface waters, wells, dwellings, areas of residential development.

(iii) The soil conditions.

(iv) The depth to groundwater. A minimum depth of one metre is recommended. For rapidly drained soils a greater depth to groundwater may be desirable. If the effects on groundwater may be critical, the services of a Regional Groundwater Evaluator should be sought.

(v) The depth of unconsolidated soils to bedrock and the nature of the rock. Application should not be allowed where the depth is less than 1.5 metres except where a site specific study shows that the risk of surface or groundwater contamination is low and a lesser depth would suffice. Areas having shallow soil cover over fractured limestone should be carefully inspected for natural sinkholes or subsidence of the surface soils. If found they are an indication of major or open fractures and the site should be avoided.

(vi) Hauled sewage should not be applied to land which will be used within six months after the application for the grazing of domestic livestock.

(vii) Fruits and vegetables should not be planted until eight months have passed after the application of hauled sewage if it has been injected into the soil or applied to prepared trenches or furrows and then covered with earth (see Method "B" in sec. 5). If the sewage was spread on the land without being covered, (Method "A" in sec. 5) the eight month period is acceptable if the land is cultivated twice so as to mix the soil. The cultivations should be at least one month apart. Without such cultivation a twelve month period should be adopted.

(viii) Hauled sewage would usually contain no parasitic ova or cysts, pathogenic bacteria or viruses, but may contain large numbers if its source is one where the individuals harbour such pathogens. For this reason land application using Method "B", wherein the sewage is covered with earth after application, is the preferred method.

(ix) In fields which have a drainage system installed the depth of soil to the drains may not be sufficient to assure the removal of viruses and possibly bacteria. Such under drained fields should be avoided unless the discharge from the drains is highly diluted or is to an area remote from human contact and not used by livestock as a source of drinking water.

(x) The use of neighboring land, pasture, crops and parkland.

(xi) Climatic conditions - rainfall, prevailing winds, hours of sunshine, etc.

(xii) The haul distance - A disposal site should be within a reasonable haul of the area to be serviced.

(xiii) Access roads - Access to the site should avoid streets wherever possible.

(d) The usable portion of any land selected for the application of hauled sewage will be that portion remaining after clearance distances and all other restrictions are applied.

5 DIRECT APPLICATION ON LAND.

(a) Method "A” - Spreading or depositing hauled sewage on the surface of the ground which includes:

(i) the use of solid waste disposal sites,

(ii) disposal at a site specifically set aside for the purpose,

(iii) spreading on agricultural land as a crop nutrient,

(iv) depositing limited quantities into pits providing the bottom soils permit infiltration. Old sand and gravel pits may be used in this manner, particularly for limited disposal in winter, providing they are remotely located and their use will not adversely affect the use of groundwater. The effluent from storage ponds (see indirect application) may be pumped to such pits and their location could influence the siting of the storage pond.

(b) Method "B" - This method applies to sites set aside for the purpose and to application on agricultural land. Care should be taken not to damage drainage tile in a field with drainage is installed. The method entails;

(i) direct application from the truck into prepared furrows or trenches after which the sewage is covered with soil, or

(ii) mechanical injection into the soil using specialized equipment.

(c) Time of application - The land slope and soil permeability govern the time of year when sewage may be applied. The following table, based on use of County Soil Maps and Tables 1 and 2 of the Ministry of Agriculture and Food's publication entitled "Drainage Guide for Ontario", provides guidance. Tables 1 and 2 are included as Appendix 13.3.2.,

Maximum Sustained Slope	Soil Permeability**	Allowable Duration Of Application (See notes)	
		Southern Ontario	Northern Ontario
0 to 3%	Any	12 mon/yr.	12 mon/yr.
3 to 6%	Rapid to moderately rapid	12 mon/yr.	12 mon/yr.
	Moderate to slow	10 mon/yr. (May to February)	9 mon/yr. June to February)
6 to 9%	Rapid to moderately rapid	7 mon/yr. (May to November)	6 mon/yr. June to November)
	Moderate to slow	None	None

Note 1: To avoid run-off hauled sewage should not be placed on frozen or ice covered ground. Exceptions may be made where the site is generally flat (slopes 0-3%) and the risk of runoff has been determined to be minimal. In such cases the minimum distance to a water course should be 360 metres.

Note 2: Spreading should be suspended during the period when spring run-off takes place.

Note 3: Area subject to flooding should be avoided.

(d) The clearances given below are a minimum when defining the usable area of a parcel of land on which it is intended to apply hauled sewage. Site specific criteria may require increased distances. The clearances shown are for the spreading of hauled sewage directly onto the surface of the ground. These values may be reduced up to 50% if the sewage is injected into the soil, or is placed in a furrow or trench and then covered over.

(i) Clearance from features as shown:

Individual dwellings	90 metres
Wells	90 metres
Public Roads	30 metres
Residential Development	450 metres

(ii) Clearances from surface waters (see notes under tabulation):

MAXIMUM SUSTAINED SLOPE	FOR HAULED SEWAGE APPLICATION MAY - NOVEMBER	FOR HAULED SEWAGE APPLICATION DECEMBER – APRIL
0 3%	60 metres	180 metres
3 - 6%	120 metres	180 metres
6 -.9%	180 metres	No sewage to be applied
greater than 9%	No sewage to be applied	No sewage to be applied

These clearances relate to the spreading of hauled sewage on the surface of soils in the rapid to moderately rapid permeability range (see App. 13.3.2) and should be doubled for soils of moderate to slow permeability.. This increase will not pertain when hauled sewage is injected into the soil or placed in a trench or furrow.

(e) The boundaries of the usable area within the clearances should be clearly marked for the haulage contractor. Stakes or other marking should be maintained until the end of the current growing season or, if applicable, until such time as any restriction on other use of the land, imposed by the application of hauled sewage, is lifted. Markings should be located so as not to interfere with agricultural activities.

(f) Where hauled sewage application is carried out by tank truck, the use of untilled land should be given preference.

(g) In some cases use of an insecticide spraying program to help eliminate the possible transmission of disease by insects may be considered.

(h) Application rates and limitations - Two considerations are involved with respect to direct application:

(i) An application rate governed by the permeability or absorptive capability of the surface soils to ensure reasonably quick absorption of the liquid element. Puddles of sewage lying on the surface for prolonged periods could create a health nuisance or increase the hazard of run-off should rains occur shortly after application. The application rates given in (i) below are designed to prevent this occurring.

(ii) A maximum loading of hauled sewage in a period of time that will avoid the build up of nutrients in excess of crop requirements on agricultural land, or the contamination of ground or surface waters beyond acceptable limits. This is further discussed in (j) below.

(i) Application Rate - The loading applied to the surface soils in a single application may be based on the following Table of soil percolation times. The Table includes a rough approximation of the relationship between percolation times and the rapid to slow permeability classifications for various Ontario soils given in Appendix 13.3.2. If a more definite relationship is required, soil testing could be conducted at the site. It is also recommended that these loadings be the total application to the soil in any seven-day period. It is important to spread the sewage over the site as evenly as possible. When truck spread by Method "A" the rate of application is difficult to control and varying the truck speed may be the only means. Application rates shown for Method "B" are greater than those for Method "A" due to the increasedarea of the sewage/soil interface and because there is less chance of run-off.

HAULED SEWAGE APPLICATION RATES
BASED ON SOIL ABSORPTION

Surface soil percolation time "T" min/cm	Approximate Agricultural classification equivalent	Maximum single application and total for any 7-day period in L/m^2	
		METHOD "A"	METHOD "B"
Less than 10	Rapid	50	75
10 - 25	Moderately rapid to moderate	15	25
26 - 50	Moderate to slow	Not permitted	15
greater than 50	Slow	Not permitted	5

NOTE:

1. If possible avoid application within 24 hours of heavy rains or just before rain.

2. Application rates during each spreading will normally be less than, but should not exceed, the weekly loading rates.

3. Area available for application is that portion of any field remaining after the clearances and slope restrictions have been applied.

(j) Total application limits for crop and ground water protection - Continued application of hauled sewage at the rates prescribed in (i) may add nitrates to the soil at a greater rate than is acceptable for the protection of ground water. It may also provide nutrients to agricultural land in excess of crop requirements. Nitrogen loading on crop land should not exceed the annual crop needs. Other sources of concern, such as phosphorus and heavy metals in some municipal sludges, occur in septage in amounts that will not be a factor if nitrogen application is controlled in this manner. A crop of corn or hay requires about 135 kg of ammonia plus nitrate nitrogen (NH_4 + -N) per hectare per year. This is about 25% of the average 600 mg/L of total nitrogen in

septage (EPA (U.S.) estimate). If the amount of hauled sewage applied each year is restricted to 1,000,000 litres per hectare (or 100 L/m2) the nitrogen load should not exceed crop needs. This loading should also provide reasonable protection to the ground water.

6 LAND DISPOSAL BY INDIRECT APPLICATION.

(a) This method assumes that conditions on the site are adverse to direct application. Examples are:

(i) Fields where the surface soils have a percolation time in excess of 50 min/cm.

(ii) Areas where the topography prevents vehicle access e.g. bush, rocky or uneven terrain.

(iii) Climatic conditions unsuited to direct application e.g. frozen ground, snow cover, etc.

(b) The indirect application method uses storage ponds into which hauled sewage is dumped and retained until it can be disposed of in the vicinity. The period of retention in the pond allows the solids to settle out. At a suitable time the clear portion (supernatant) is then pumped from the pond and disposed of by one of the methods of direct application. Continued use of a pond will depend on the degree to which the settled solids eventually reduce the liquid capacity and depth of the pond.

Storage ponds should be located at or near the final disposal site. Ponds 1.5 metres in depth, plus 1 metre of freeboard, having a capacity of about 1350 cubic metres have been used. Normally two ponds are provided and filled alternately. Proper construction and maintenance are important. Discharge should take place at a time when soil conditions are favourable and any health hazard to the community is minimal. Avoid discharge during the tourist season.

A GUIDE TO THE TREATMENT OF SEPTAGE IN WATER POLLUTION CONTROL PLANTS

1 SUMMARY

In general, there appears to be every likelihood that successful treatment of septage can be achieved at WPCP's provided intelligent handling is applied. There are not many tools available to plant staff to allow prediction of the effect of septage upon treatment facilities. However, the few which are available, RR, DO, settling test, pH, allied with a good appreciation of WPCP design criteria, should provide very useful guidelines. Where such tests can not be conducted, rule of thumb guides will have to be used in making a decision. These might be that septage should not be accepted in the following circum
stances:

(a) In a WPCP presently experiencing difficulty in maintaining D.O.

(b) In a WPCP which is already constantly hydraulically overloaded;

(c) During flow peaking periods (suggests use of holding or equalization tank for septage);

(d) In a WPCP which is already constantly organically overloaded;

(e) In an anaerobic digester which is already organically or hydraulically overloaded or experiencing difficulty in maintaining proper operating temperature;

(f) In an aerobic digester;

(g) In an amount exceeding 10% by volumne of WPCP average daily flow.

2 INTRODUCTION

(a) The term "septage" is used to describe the material which is periodically removed from septic tank systems. In a septic tank system the heavier solids in the substrate are settled to form a sludge while the lighter solids rise to the surface to form a scum. Both are retained in the tank, while the supernatant overflows to a leaching bed. The sludge undergoes anaerobic decomposition. Occasionally the sludge and scum must be removed so that the sewage flowing through the tank does not scour the sludge and cause solids to overflow to the leaching bed where they may plug the bed. This maintenance should be carried out as required (average once every 3-5 years). The characteristics of hauled sewage, particularly those of septage are outlined in Article 13.1 and Appendix 31.1.1.

(b) The purpose of this guideline is to provide assistance to utility operations personnel related to the acceptance and treatment of septage in wastewater treatment facilities. It has been prepared with the concurrence of the Ministry's Wastewater Treatment Section.

3 CHARACTERISTICS OF SEPTAGE

(a) Table 3 of Appendix 13.1.1 shows the chemical characteristics of septage from three separate Ontario systems. The Hawkestone septic tank system received only toilet wastewater, the Orillia Hospital House, toilet, bathroom and kitchem wastewater, and the Whitby Station, toilet, bathroom, kitchen, and laundry wastes.

(b) The results show that typical Ontario septage is high in pollutional characteristics, resembling anaerobic digester supernatant liquor. The most important feature of the results is that they indicate a nitrogen deficiency with respect to activated sludge treatment of septage. Normally, a BOD/N/P ratio of 100/5/1 is accepted as necessary for activated sludge metabolism of wastes. In Table 3 of Appendix 13.1.1 the three septages show ratios of 100/3/10, 100/1/1 and 100/0.5/1.7 respectively.

(c) Results published in the United States on septage quality show some similarity with Ontario results although U.S. COD values appear to be much higher, as evidenced in Tables 4 and 5 of Appendix 13.1.1. This may be due, however, to the higher solids levels which seem to be associated with U.S. septage.

(d) Heavy metal concentrations in U.S. septage are shown in Table 6 of Appendix 13.1.1., Zn, Cu, Fe and Al are the only metals present in appreciable quantities. It is likely that Ontario septage metal concentrations would be lower than those shown in the table as the metals are most likely insolubly bound in the solids and, as noted earlier, Ontario solids levels appear to be considerably lower than those seen in the U.S.

(e) A physical characteristic frequently attributed to septage is poor settling performance.

4 TREATMENT OF SEPTAGE IN WPCP'S

As septages can vary considerably in characteristics, they can be viewed as either high strength wastewaters, or as sludges which have undergone some degree of anaerobic digestion. This allows considerable latitude in the approach to treatment in WPCP's. However, in the strict sense, neither of the above descriptions alone adequately describes septage. The bulk of the pollutional characteristics of septage appears to be closely associated with the solids, while septic tank supernatants closely resemble raw sewage in character. Thus septage, being an approximate 50/50 blend of sludge and supernatant is difficult to classify. It is probably most similar in general character to poor quality anaerobic digester supernatant liquor as the solids levels of 1-1.9% do not allow a sludge appellation; digested sludge generally containing approximately 3% solids and raw sludge, 4-6% solids.

5 PRIMARY TREATMENT SYSTEMS

(a) As the literature indicates that the settling characteristics of septage are only fair to poor, there seems to be no purpose in providing for their treatment by settling in a primary treatment WPCP. If such a facility must accept septage, it should preferentially be introduced directly into the anaerobic digester through a primary scum-pit.

(b) Where the septage includes large amounts of grit and rags, it may have to be included with the WPCP flow to provide screening and degritting operations otherwise fouling the digester could occur. In such cases, a slight worsening of final effluent quality would have to be accepted from time to time.

6 CONVENTIONAL TREATMENT

It has been reported that some septages contain significant quantities of grit and rags, therefore introduction of septage to a conventional WPCP should be made prior to screening and de-gritting facilities. These features, followed by primary sedimentation, would provide removal of some portion of the septage solids and help reduce the associated organic loading on the activated sludge section of the WPCP. The solids removed in this manner would be directed to the anaerobic digester where some residual digestion would occur.

(a) Primary Clarification

(i) As primary clarifiers operate within hydraulic retention time and surface loading design limits, discharges of septage should be judiciously applied to prevent excessive loadings. This suggests the use of holding tanks to allow controlled septage feedings during low flow periods.

(ii) It is difficult to predict the frequency and quantity of septage discharges which individual WPCP's would encounter. In most cases, however, the septage would represent a relatively small fraction of the overall plant flow, minimizing potential hydraulic problems.

(b) Activated Sludge Section

(i) As previously shown, septage appears to be nitrogen deficient. This should not be of particular concern as the quantity of septage added to activated sludge systems would likely be a relatively small fraction of the overall feed; the latter generally containing nutrients in excess quantities. The literature generally shows that septage can be treated quite successfully by the activated sludge process, up to a level of 10% by volume in the plant feed.

(ii) As there appears to be an upper limit to WPCP feed septage content, flow equalization tanks may be needed. Constant low rate feeding, as opposed to slug doses is preferable in any type of biological treatment. This indicates that a WPCP receiving septage equaling say, 10% of its normal daily flow would definitely require flow equalization to allow 24 hour septage feeding. WPCP's receiving lower septage volumes of 1-2% D.W.F. could likely discharge the waste with impunity. However, it is always preferable to plant staff to feed digester supernatant liquor to the activated sludge section during low flow periods; usually at night. Septage would probably be handled in similar fashion. Thus, there may be a requirement in many, if not all, WPCP's for a septage holding tank, allowing controlled discharge.

(iii) A common concern in the treatment of septage by activated sludge systems is the associated increased oxygen demand. Where an existing system's aeration capacity is marginal, inclusion of significant quantities of septage may not be possible without providing additional aeration capacity.

(c) <u>Tests for acceptance of septage into activated sludge section</u>

The ability of an aeration system to accept septage can be fairly easily assessed by the use of some tests that are quick to take and are generally reliable. The tests should be conducted on a sample of septage supernatant obtained after a settling test, as that is the portion which would be received in the activated sludge section of the wpcp.

(i) The overall coefficient of oxygen transfer, K_La, is related to tank dissolved oxygen, D.0., and microbiological respiration rate, RR, by the term:

$$K_La = \frac{RR}{C_s - C}$$

where C_s = D.0. saturation at tank temperature;
C = tank D.0.

(ii) The operator can measure his present DO and RR, and by adding a quantity of septage equal to the proposed plant discharge amount to a sample of activated sludge, can predict the tank RR and DO associated with septage treatment. For example, assuming that the KLa of the aeration equipment does not change as the temperature is a constant, the tank D.O. with septage added can be quantified and predicted from the equation;

$$\frac{RR}{C_s - C} = \frac{RR_s}{C_s - C_x}$$

Where RR_s = respiration rate of activated sludge with septage added;

C_x = tank D.O. with septage added.

(iii) Another on-site analysis which may aid an operator in accepting septage is pH.

(iv) Analyses such as BOD, COD, nitrogen, etc., are of historic value only, as samples of septage must be submitted to the Regional or Main Laboratory for analyses and results are generally not received for several weeks.

(d) Heavy metals in the activated sludge section

It is unlikely that addition of septage to an activated sludge process would feature heavy metal toxicity. Heavy metal concentrations are fairly low (Table 6 of Appendix 13.1.1) and as the septage would likely be a small fraction of the WPCP overall flow, metal effects should be insignificant. In addition, solids settling and removal in the primary clarifiers would also remove the majority of metals as they are no doubt insoluble.

(e) F/M Ratio in the activated sludge section - A further but perhaps lesser concern in adding septage to activated sludge systems is the maintenance of reasonable F/M ratios within plant design limitations. It is probable that in most cases, septage volumes would represent low fractions of the overall WPCP flow (1-10%) and that after screening and primary sedimentation, the additional imposed loadings would be acceptable. In addition, constant daily loadings of septage to WPCP's

are, improbable and activated sludge systems, even if organically overloaded on occasion, generally exhibit good resilience to, and rapid recovery from, mild upsets.

Final clarifjers and chlorine chambers should be unaffected by septage additions to WPCP's beyond hydraulic considerations outlined in other section.

(f) Final clarification - It is unlikely that infrequent discharges of septage to WPCP's would seriously effect the hydraulic characteristics of the system, particularly where such discharges are a small fraction of the overall plant flow. However, it is possible that from time to time, any particular WPCP may receive quantities of septage requiring careful handling. The unit operation most immediately adversely affected by hydraulic overloading is final clarification. Design loading on final clarifiers based on average DWF is generally in the order of 1/3 to 1/2 the maximum permissible loading with a peaking factor applied. This suggests a considerable reserve capacity in final clarifiers. However, during diurnal peak flows, reserve clarifier capacity is reduced and inclusion of significant quantities of septage could cause hydraulic overloading with a loss of 'solids from the system. Thus, there may be a need for holding tanks to allow controlled, off-peak, discharges of septage in some WPCP's. As noted elsewhere in this report, overnight feeding of septage would probably be preferable to operators, to avoid hydraulic and organic loading disruptions.

(g) Anaerobic digestion

The major concerns in feeding the additional solids from septage treatment to an anaerobic digester are maintenance of digester temperature and the effect on digester loading.

(i) To assess the additional heating demands, plant staff can use the following calculation (assuming the specific heat of the feed is 1.0):

Heat Required (BTU/day) = $Q_s.10.\Delta T$

Where Q_s = gpd septage feed;

ΔT = Digester temperature (°F) - Feed temp. (°F).

Comparison of the result of the calculation with the digester heat exchanger capacity will allow a good assessment of the capacity of the WPCP equipment to handle the additional loading.

(ii) In assessing the ability of a digester to accept an additional organic loading, the following calculation can be used:

$$\text{Loading} = \frac{Q.1O.\%TS.\%TVS}{V}$$

where Q = gpd total digester feed (including septage portion);

%TS = % total solids in feed;

%TVS = % total solids which are volatile;

V = digester volume in ft^3.

While there are no published upper limits for digester organic loading in Ontario, it is suggested that the applied loading from all sources not exceed 0.15 lb TVS/ft^3/day for satisfactory operation. Thus in facilities presently featuring this loading, inclusion of septage solids may not be possible.

(h) Observations on testing - The more obvious difficulty in the above from an operator's viewpoint is in knowing what portion of septage admitted to the WPCP headworks will ultimately settle in the primary sedimentation tanks and be fed to the digester. Possibly the best appreciation of this quantity can be gained from laboratory settling tests simulating plant-scale settling operations. Analysis of the settled solids for IS and TVS would allow digester loading calculations to be made while analyses of the supernatant for BOD/COD/nitrogen,

etc., would provide data related to the activated sludge section. It is expected that plant staff would be required to conduct considerable laboratory tests initially to characterize the septages as received and after primary treatment. However, with time, the additional workload would diminish as characterization of the septages from regular sources progressed, yielding a backlog of data.

7 CONTACT STABILIZATION AND EXTENDED AERATION FACILITIES

These systems generally feature only aeration, aerobic sludge digestion or aerated holding tanks, final settling and chlorination. Thus, the organic and hydraulic effects of septage additions will be greater on the aeration and final settling tanks than those in conventional plants as all the septage would be directed to the activated sludge system. Again, the limiting factor hydraulically would be the final settling tanks where care would be required. The additional demands upon the aeration systems of these facilities can be assessed as described earlier.

8 AEROBIC DIGESTION

(a) It can be fairly emphatically stated that septage should not be discharged directly to aerobic digesters for the same reason that raw sludge should also be excluded. Briefly, the air supply and hydraulic retention requirements in aerobic digesters featuring these waste streams would be so high as to negate the inherent cost advantages of aerobic digestion. Apart from costs, final digested sludge quality would likely be compromised also.

(b) Waste activated sludge concentration and age modification in extended aeration plants receiving large volumes of septage could also compromise aerobic digester performance. Aerobic digestion depends upon long sludge ages (45 days minimum) to achieve solids stabilization. Sludge age and hydraulic retention time are dissimilar in aerobic digesters and should not be confused.

(c) While small infrequent additions of septage would not modify waste activated sludge age appreciably, frequent large dosages could reduce sludge age by promoting higher MISS growth rates. In addition, the upper organic loading level to aerobic digesters should betaken as 0.14 lb TVS/ft^3/day, and as many aerobic digesters in Ontario appear to be marginal in performance, great care should be taken to avoid appreciable increases in loading to them. Disposal of septage to an aerobic digester is therefore not encouraged.

SOIL PERMEABILITY RELATED TO

AGRICULTURAL SOIL TYPES

NOTE: This information is excerpted from the Ministry of Agriculture and Food's publication No. 29 entitled "Drainage Guide for Ontario".

DRAINAGE KEY FOR SOIL GROUPS*

**SOIL GROUP	PERMEABILITY (HYDRAULIC CONDUCTIVITY)	SLOPE	TYPICAL SOIL TYPE
1a	Slow	Level to depressional	Jeddo
1b		Undulating to 5% slope	Haldimand
1c		Rolling 5 to 30% slope	Caistor
2a	Moderate	Level to depressional	Simcoe
2b		Undulating to 5% slope	Brookston
2c		Rolling 5 to 30% slope	Perth
3a	Moderately	Level to depressional	Parkhill
3b	Rapid	Undulating to 5% slope	London
3c		Rolling 5 to 30% slope	Guelph
4a	Rapid	Level to depressional	Granby
4b		Undulating to 5% slope	Tioga
4c		Rolling 5 to 30% slope	Burford
5	Variable	Bedrock at less than 2 feet (0.6 metre)	Farmington

* See following pages for index of soil group.
**Soil Group drainage characteristics:

Group 1: Slow - 1.27 to 2.54 mm hour
Group 2: Moderate - 6.35 to 25.4 mm hour
Group 3: Moderately Rapid - 25.4 to 63.5 mm hour
Group 4: Rapid - 63.5 to 127 mm hour
Group5: Varies due to shallow soils

INDEX OF SOIL GROUPS

SERIES NAME	SOIL GROUP	SERIES NAME	SOIL GROUP	SERIES NAME	SOIL GROUP
Alberton	2c	Caistor	1c	Elmsley	5
Allendale	4a	Caledon	4c	Embro	3b
Alliston	4b	Camilla	4b	Emily	3b
Almonte	2c	Campbell	2c	Englehart	4a
Ameliasburg	5	Cane	3a	Evanturel	3c
Ancaster	3c	Carp	2c	Falardeau	3a
Appleton	3c	Casey	3b	Farrnington	5
Atherley	1a	Cashel	2c	Ferndale	2a
Bainsville	3a	Castor	3b	Flamboro	4a
Balderson	3b	Chesley	2b	Fonthill	4c
Bamford	4b	Chinguacousy	1b	Fox	4c
Bancroft	4c	Christy	3a	Foxboro	3a
Bass	1b	Clyde	21	Franktown	5
Bastard	5	Codrington	3b	Galesburg	3c
Battersea	2c	Colborne	4c	Gänonoque	2c
Bearbrook	1a	Colwood	3a	Gerow	2a
Belmeade	1a	Cooksville	5	Gilford	4a
Bennington	3c	Coutts	3b	Gordon	2c
Berriedale	3c	Craigleith	1b	Granby	4a
Berrien	4b	Cramahe	4c	Grenville	3c
Beverley	2b	Crombie	3a	Grimsby	4c
Binbrook	1b	Dack	1c	Guelph	3c
Blackwell	2a	Dalton	4b	Guerin	3b
Blanche	3c	Darlington	3c	Gwillimbury	4b
Bolingbroke	4c	Dawson	3c	Haileybury	1c
Bondhead	3c	Deloro	3c	Haldimand	1b
Bookton	4b	Doe	3a	Hanbury	1b
Brady	4b	Donnybrook	4c	Harkaway	3c
Brant	3c	Dumfries	3c	Harriston	3c
Brantford	2c	Dummer	3c	Harrow	4c
Brethour	3a	Dundonald	4b	Havelock	4c
Bridgman	4c	Dunedin	1c	Hendrie	4b
Brighton	4c	Dymond	3b	Henwood	4c
Brisbane	4b	Eamer	3c	Hillier	5
Brockport	5	Earlton	3b	Hillsburgh	4c
Brooke	5	Eastport	4c	Himsworth	2b
Brookston	2b	Edenvale	4b	Hinchinbrooke	3b
Bucke	4b	Eganville	3c	Honeywood	3c
Burford	4c	Elderslie	2c	Howland	3b
Burnbrae	5	Eldorado	3c	Huron	2c
Burnstown	3c	Elk Pit	4c	Innisville	3a
Burpee	4a	Ellwood	2c	Jeddo	1a
Buzwah	2c	Elmbrook	1c	Kagawong	5

INDEX OF SOIL GROUP (Cont'd)

SERIES NAME	SOIL GROUP	SERIES NAME	SOIL GROUP	SERIES NAME	SOIL GROUP
Kars	4c	Murray	3b	St. Thomas	4c
Kemble	2c	Napanee	1a	Stafford	3b
Kenabeek	4a	Nelson	2c	Stockdale	3a
Killean	3b	Newburgh	3c	Sullivan	4c
King	2c	Newcastle	3c	Sutton Bay	3a
L'Achigan	4b	Niagara	1b	Tansley	2c
Lambton	2c	Nipissing	3b	Tavistock	3c
Lanark	2c	Norham	3c	Tecumseth	4b
Lansdowne	1b	North Gower	2a	Teeswater	3c
Leech	2c	Oneida	1c	Tennyson	3c
Leith	3c	Osgoode	3a	Thames	2b
Leitrim	5	Oshtemo	4c	Thorah	4a
Ily	3a	Osnabruck	2a	Thornloe	1a
Lincoln	1a	Osprey	3c	Thwaites	3c
Lindsay	2b	Otonabee	3c	Tioga	4b
Listowel	3b	Otterskin	4b	Toledo	2b
LittleCurrent	5	Parkhill	3a	Trafalgar	5
Lockport	5	Peel	2c	Trent	3b
London	3b	Pense	3b	Tuscola	3b
Lovering	1b	Percy	3c	Tweed	3c
Lyons	3a	Perth	2c	Uplands	4c
Magnetawan	2c	Petherwick	3a	Vars	3c
Mallard	4b	Piccadilly	3b	Vasey	3c
Malton	2a	Pike Lake	4c	Vincent	2c
Manotick	4b	Plainfield	4c	Vineland	4b
Maplewood	3a	Pontypool	4c	Wabi	3c
Marionville	2a	Powassan	2a	Waterloo	4c
Matilda	3b	Raglan	4c	Waupoos	2c
Matson	3b	Rubicon	4b	Wauseon	4a.
McCool	1b	Sargent	4c	Wayside	4b
Medonte	1c	Saugeen	2c	Welland	1a
Milberta	2a	Schomberg	2c	Wemyss	3b
Mill	4b	Seelys Bay	2c	Wendigo	4c
Milliken	3b	Shashawanda	5	Westmeath	4c
Minesing	2b	Sidney	1a	Whitby	3b
Mississauga	5	Simcoe	2a	White Lake	4c
Monaghan	2c	Smithfield	2c	Whitfield	5
Monteagle	3c	Smithville	1b	Wiarton	3b
Moose	3a	Solmesville	2c	Winona	4b
Morley	1a	South Bay	1c	Woburn	3c
Morrisburg	2c	St. Peter	4c	Wolford	2c
Moscow	2a	Ste. Rosalie	1a	Wooler	3c
Mountain	4b	St. Samuel	4a	Wyevale	4c

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CHAPTER 14

July 1984

CHAPTER 14

LARGE SEWAGE SYSTEMS AND SPECIAL APPLICATIONS

LARGE SUB-SURFACE SEWAGE DISPOSAL SYSTEMS

1 GENERAL

(a) In addition to the common use of sub-surface sewage disposal systems for residences, small stores, gas station restrooms, etc. there are many proposals for the use of this method of sewage disposal where large buildings, or a number of buildings, are to be served. Sewage systems of this type may include fairly extensive sewage collection systems and, in all respects, other than the means of final disposal, may be similar to systems from which the final effluent is discharged to surface water. They may, therefore, be similar to discharging systems as far as flow computations, design criteria, construction, operation and maintenance are concerned.

(b) The purpose of this Article is to provide guidelines with respect to the planning, design, construction, operation and maintenance of large Class 4 and Class 6 sewage systems. This Article is supplementary to the regulations and to Articles in Chapters 6,8,9 and 12, in which the basic principles and design standards are provided.

(c) Without being all inclusive, some typical examples of large systems are those serving:

(i) Nursing homes, hotels, motels and institutions.

(ii) Subdivisions (where the provisions of Section 5 of O.Reg. 374/81 are followed).

(iii) Mobile home parks and tent and trailer parks.

(iv) Clubhouses.

(v) Recreational parks and centres.

(vi) Industrial and commercial parks, establishments and plazas.

(vii) Residential condominiums where each sewage system serves several units.

2 LARGE SUB-SURFACE SEWAGE DISPOSAL SYSTEMS VS. MUNICIPAL SYSTEMS

(a) Proposals to adopt large subsurface sewage disposal systems are sometimes made as a result of non-availability of a municipal sewer system. Where the municipal sewer services are in an adjacent area, but require either sewer extension, treatment plant enlargement, or both in order to serve the new development, the authority reviewing the development should ensure that the proposal is not in conflict with zoning by-laws or the Official Plans for the area. Approval of pockets of development on private sewage in the fringes of an expanding community can create long range problems for servicing.

(b) While this guideline is not intended as a statement on land use, it is acknowledged that the most appropriate applications of large subsurface sewage systems lie in areas not likely to be serviced by municipal communal systems in the future. When considering the use of large subsurface systems in these areas, it is especially important to take into account the individual and cumulative effects of existing and future adjacent land uses on the operation of the systems and vice versa.

3 GENERAL CONSIDERATIONS - LARGE VS. SMALL SEWAGE SYSTEMS

The principles of design, construction and operation for the treatment and disposal part of large systems are similar to those for small residential or commercial systems and the requirements of the regulations apply. While residential system design is determined to a large extent from tables in the regulations, other systems must be designed from first principles. The basic approach to sewage system design using first principles does not vary

with system size. The size and complexity of a system do, however, add to the number of factors that must be considered in design, and complicate some that are common to systems of any size, so that a more detailed and professional approach is necessary. Such factors include:

(a) Hydraulic dispersal to the soil of large volumes of liquid may produce problems out of proportion to the increase in sewage flow from a small to a large system. This is especially true where the soils underlying the leaching bed present an increasing resistance to downward percolation as the depth increases, and where the lateral outflow potential of the more permeable upper soil layers limits site acceptability. The resistance to dispersal in the soil causes the sewage to mound over the area of its application to a height that will create sufficient pressure to overcome the resistance. The mounding of sewage above a soil layer of low conductivity, or above the water table, has been covered in Sections 8.1.3 and 8.4.8(c), and in Appendix 8.4.2. Dispersal in the underlying and surrounding soil without breakout to the surface is affected by:

(i) The area covered by the leaching bed. For the same sewage flow, a leaching bed constructed in a soil of low percolation time will require less area and will concentrate the application of sewage to the soil per unit of area, compared to a leaching bed treating the same sewage flow in a soil of higher percolation time.

(ii) The permeability and thickness of the underlying soil strata.

(iii) The depth to water table and its hydraulic gradient. The possibility of. peak sewage flows occurring at the same time as high ground water conditions, and the effect of heavy lawn sprinkling, or the diversion of surface waters, must be considered.

(iv) The direction of movement of the groundwater away from the bed, and whether or not the subsurface configuration at some point in that direction may restrict the outflow of sewage.

(b) The discharge in one location of a relatively large amount of contaminants into the soil makes their attenuation more difficult than in individual residential systems and emphasizes the need to assess the effects on the ground water.

(c) The sewage collection system - This may be much more extensive than a single building sewer and include manholes, lift stations, pump chambers, etc.

(d) The assessment and computation of daily sewage flow - A knowledge of peak hourly and daily flows is necessary for the proper selection of treatment plant to meet these conditions.

(e) The site conditions - Site topography, drainage, high water table and the prevalance of rock or soils of low to unacceptable permeability (T greater than 50 min/cm) may be restrictive to the location of large sewage systems because of the large area required. Where fissured rock is prevalent in the area, the location may be unacceptable because of the adverse effects on ground water.

(f) Sewage quality - Normal residential sewage contains waste from many sources, but the overall quality is suited to treatment in Class 4 or Class 6 sewage systems. In a large commercial system, some constituents in the sewage, which are of a type not suited to treatment in a subsurface sewage disposal system, may be present in greater proportions than they are in residential sewage, and thus have a greater bearing on equipment selection and system design. An example is the concentration of washing detergents or disinfectants. A proposal should not be approved if the sewage is of a quality unsuited for disposal in a soil absorption system. Very high BOD or a significant heavy metals content are examples of sewage not suited for treatment in sewage systems under Part VII.

(g) Design and construction problems - These are magnified in the case of larger sewage systems: Examples are:

(i) The greater difficulty in removing topsoil and preparing the leaching bed and mantle area for fill placement without adversely affecting the percolation time of the native soils.

(ii) The layout of the leaching bed to best meet site conditions.

(iii) Errors in construction that result in uneven distribution of the sewage in the leaching bed. Construction requirements are outlined in Section 14.1.11. Particular attention is required to prevent uneven settlement of component parts during system use.

(iv) The design requirements of sewers, manholes, pump or siphon chambers, etc. and the selection of treatment tanks.

(v) The requirements for future system expansion, the need for spare area in case of failure, and possibly the adoption of a phased construction program related to the development of the building project.

(h) The relationship and responsibility of the owner, the designer, the contractor and the equipment manufacturer. These become more complex and need to be clearly established at the time of system approval.

4 APPLICATION OF THIS GUIDELINE

(a) As can be seen from the above considerations there is a grey area separating cases where the assessment, design and construction of a sewage system can be accomplished using simple field investigatory techniques and the Tables provided in the standards, and cases where professional engineering is required. System size is not the only factor. Further, the degree of professional expertise required can vary from project to project.

(b) The regulation divides sewage systems into two groups, depending on whether the daily sewage flow exceeds, or does not exceed, 4500 litres. This distinction does not, however, address the difference between large and small sewage systems made in this guideline. The principal difference lies in the area of complexity and the need for professional design, construction supervision and operation. A sewage system of quite high daily sewage flow, serving a single building, and located on a site ideally suited to sub-surface disposal, can be much simpler to design and construct than one having a smaller daily sewage flow, but requiring a sizable sewage collection system containing appurtenances such as one or more manholes, or a sewage pumping station. Site topography and hydraulic capacity, surface drainage, ground water movement and the need to import soil for the leaching bed and mantle are all matters that affect the complexity of the sewage system.

(c) It is intended that each proposal be judged on its size and composition, and on the merits of the site, before the Director decides that all, or only some of, the requirements of this guideline be made to apply to all, or only part of, the proposed sewage system. To determine the applicability of the guideline to a specific project it is most important that the design consultant meet with the approving Director at the earliest date on which the scope of the proposal can be discussed. This need is further emphasized in sections 7(b) and 9(b) of this Article. Early consultation will remove subsequent misunderstanding of the requirements and avoid unnecessary design costs. It should help to limit the amount of professional site investigation to that which is necessary to demonstrate the acceptability of the site for the project, and to establish the minimum requirements for design and construction supervision before these phases of the project commence.

(d) Although no fixed definition of a "large" sewage system is set forth, it is recommended that this guideline be applied to sewage systems as follows:

(i) For general site investigation purposes, to a sewage system having a daily sewage flow exceeding 10,000 litres. In addition, a hydrogeological investigation is recommended where the average percolation time of the soil over the area of concern, taken at a depth of one metre, exceeds 15 minutes per centimetre, and in all cases where the design daily sewage flow to a sewage system exceeds 50,000 litres or, in the case of subdivisions, condominiums or other developments where more than one sewage system is involved, the total design daily sewage flow exceeds 15,000 litres per hectare.

(ii) For design and construction purposes, to a sewage system

- in which the leaching bed requires over 500 metres of distribution pipe, or
- in which the collecting sewer is connected to more than 5 building sewers, or
- in which the collecting sewer requires one or more manholes, or a sewage pumping station, to meet the Ministry's Guidelines for the Design of Sanitary Sewage Systems. (In that guideline manholes are required at all junctions, changes in grade, size or alignment (except with curvilinear sewers), and termination point of sewers.)

5 RESPONSIBILITY FOR THE PLANNING, DESIGN, APPROVAL, CONSTRUCTION, OPERATION AND MAINTENANCE OF LARGE SYSTEMS

The division of responsibility outlined hereunder is considered to be good practice. It can be varied to suit special circumstances. The owner must understand from the start that, regardless of whether other individuals prepare the design, or contribute to its preparation, or supervise construction, or carry out operation or maintenance duties, the application for approval, the Certificate of Approval, and the Use Permit for the system, will be in the owner's name. The regulatory and approving

authorities will, therefore, deal with the owner on any points of contention. For this reason, the owner should ensure that the arrangements with designers, contractors, operators and service contractors are well documented and clearly defined as to responsibilities. A suggested division of responsibility is as follows:

(a) The owner should retain a consulting engineer, or an individual familiar with the design of sub-surface sewage disposal systems, to carry out the planning, site investigation and design of the system and the preparation of the application for the Certificate of Approval. The owner, subsequent to approval, should arrange with the consultant for the calling of tenders, the review of bids, awarding of contracts and supervision of the work. This to be followed by the preparation by the consultant of "as-built" drawings and of the Certificate to the approving authority that may be. required pursuant-t to a condition in the Certificate of Approval, as discussed in Section 11(b) below, before a Permit is issued. The owner is responsible for ensuring a good standard of operation and maintenance and may require the consultant to select and train, or arrange for the training of the operating personnel. Arrangements with the consultant should be clear as to any continuing responsibilities he may have during the initial period of operation and the duration of this responsibility should be established in advance.

(b) The consulting engineer, or other qualified individual, should report to the owner and represent him throughout his contract. Without attempting to present an all inclusive list of his responsibilities they should include:

(i) Familiarity with the applicable Acts, regulations, guidelines, codes and municipal by-laws.

(ii) Determination of all design criteria.

(iii) Review of alternative solutions and costs. In reviewing alternatives, manufacturers should be contacted concerning the suitability of their products in meeting the requirements.

(iv) Preparing the application for Certificate of Approval for the recommended system. In addition to meeting the requirements of all regulations, codes and by-laws and sound engineering principles, the system designer should obtain the concurrence of the manufacturer of any packaged treatment plant which is to be used, that the model and size of plant proposed is a proper selection considering all the project requirements and the design of other parts of the system. A copy of the manufacturer's written concurrence should be included with the application.

(v) Tasks as required according to the scope of his contractual arrangements with the owner. This would include submission of the application for the Certificate of Approval and, if preparing contract documents, ensuring inclusion of any pertinent conditions included in the Certificate as approved by the issuing Director. On receipt of approval, and prior to proceeding with the work, he should discuss with the Director any terms or. conditions of the Certificate about which he is in doubt, or that he considers are impractical under the site conditions, and any terms and conditions he considers advisable that may have been overlooked by the Director.

(vi) Supervision of construction. If only retained for partial supervision he should at least ensure that good practice is followed in preparing the leaching bed area to receive fill and that the proper fill is placed.

(c) <u>The equipment manufacturer must:</u>

(i) Become fully conversant with the proposal, the design criteria and the various modes of operation that could occur, particularly sewage quality, quantity and flow pattern, so as to ensure that the treatment plant is the proper one for the job.

(ii) Provide the designer with all printed literature covering the equipment, including warrantees and guarantees, and instructions regarding installation, operation and servicing. He should make recommendations as to the training of operating staffs and the acceptability of service contractors.

(iii) Review the completed system design prior to submission of the application for Certificate of Approval and advise the designer of any changes essential to the optimum operation of the equipment and, when satisfied that the treatment plant is compatible with the system design, provide the designer with a statement of concurrence in the design.

(iv) At the completion of construction of the system, provide the construction supervisor (or owner) with a letter indicating his satisfaction that the system as installed will not prejudice any warrantees or guarantees on the equipment or, alternatively, advise of problems that will.

(d) The Contractor is required to hold a Class 1 License as an installer. His responsibilities are those normally associated with contracting and good workmanship. Section 4(1) of the regulation requires that he must follow the regulations and the terms of the Certificate of Approval. This includes the contract drawings and specifications and any conditions included on the Certificate. He should examine the site before work commences and draw to the designer's, or the owner's, attention, any circumstances which prevent him from carrying out the work in accordance with the terms and conditions of the Certificate. Such matters that cannot be resolved shall be drawn to the Director's attention. Work must not be undertaken where an alteration to the terms and conditions of the Certificate is necessary until the Director has so approved.

(e) The approving Director should conduct a thorough review of the application to determine the acceptability of the proposal in all respects, or to disclose any conditions which should be placed on

the Certificate of Approval in order to make the proposal acceptable.

(i) The Director should consider the individual and cumulative effects of the operation of the project on the existing and future uses of adjacent land and vice versa. For instance, he should consider the cumulative effects of subsurface sewage disposal systems on surface drainage patterns, ground water movement and water supplies, both on and off the site.

(ii) The site inspection should include examination of test pits and a discussion with the designer so that agreement is reached on all important points. Without being inclusive, examples are: the daily sewage flow, peak flows, sewage quality, tank size, percolation times for the soil to be used in the leaching bed, for the underlying soil and for the soil mantle,, the source and quality of fill material, and the general layout of the system, particularly of the distribution pipes. Evidence presented with the application to. show that the site has the hydraulic capacity for the system is most important. Such evidence should be the result of a profes sional study unless the Director decides that site acceptability can be determined without such a study in light of favorable site conditions and the overall simplicity of a proposed sewage system.

(iii) Ownership and operating and maintenance responsibilities should be clarified.

(iv) Any special conditions should be included in the Certificate of Approval. For example:

- A requirement to register on title the need for a service contract if a Class 6 sewage system is installed, and the need. for including information respecting the servicing requirements in any Offer of Purchase or Sale.

- Special design features to permit adaption to site, e.g. retaining walls, drains to intercept surface run-off or ground water and divert it around the leaching bed.

- A requirement for a spare area to allow for system enlargement should problems arise.

- Designation of any area which is to be set aside for expansion of the system to handle an enlarged facility.

- Any specific requirments respecting construction, such as supervision, or a certification on completion that the design has been met.

- Any special conditions of operation and maintenance.

- Any limitations on the types of sewage flow to be treated, e.g. waste from a laundromat may be treated and disposed of in a separate sewage system or pre-treated before its acceptance in the system under design.

- Any limitations on plumbing fixutres, e.g. a prohibition on the use of urinals that flush automatically on a timed basis.

- Any requirements or parameters that must be met for protection of the ground water and monitoring to ensure that any specified criteria for acceptable water quality discharge and water levels at various points on the site, and perhaps off the site as well, are not offended.

- Any restrictions on the use of parts of the property, or of neighbouring properties, considered necessary in relation to the attenuation zone established for the contaminants in the leaching bed effluent. The condition describing such restrictions could include a requirement that a description of the attenuation zone be attached to the Certificate of

Approval, and may require registration of the Certificate on title of the property and/or that of a neighboring property so that the existing and future property owners are informed. If restrictions are imposed on a neighboring property, the appropriate easements should be prepared and registered on title (see also Notice 6/83 dated August 15, 1983). The condition could require that the above actions take place prior to the commencement of construction of the sewage system.

- In the case of mobile home parks or other residential areas, where a sewage system serves a number of permanent homes, the Director may require the owner to enter into an agreement with the municipality, which provides for municipal operation in the event of default by the owner for any reason. An alternative arrangement would be to require municipal ownership of the sewage system, the extent of which should be clearly defined. In such an arrangement, the municipality could lease the system back to the mobile home park owner, or condominium owner or association, for a nominal amount with the lessee responsible for all operation and maintenance according to the standards. This option avoids possible disputes on ownership should the operator default for any reason. The terms of the lease should provide the municipality with right of access and responsibility for operation and maintenance if the lessee defaults.

(v) If, in the Director's opinion, there is insufficient data included with the application to demonstrate the acceptability of the proposal, he should indicate to the applicant the additional information required.

(vi) The Director may wish assistance in the review of the application. For example, assistance may be requested from the Ministry, through its District and Regional Offices, in the review of the project in respect to its overall environmental

aspects, or of the design for the sewage collection system or other portion of the project.

6 SEWAGE QUALITY

If the quality of sewage is comparable to that of daily household wastes, no problems are foreseen. Some large systems may be proposed for the disposal of sewage of a quality not suited for sub-surface disposal. Articles in Chapter 14 give special reference to some of these, such as wastes from laundromats, slaughterhouses, and automatic car washes. Sewage systems for these wastes may require some form of pre-treatment of the sewage to ensure its suitability for treatment in a Class 4 or Class 6 sewage system. The installation of grease traps, and the addition of chemicals are examples. In some cases an increase in the retention period in the treatment tank may provide a solution.

7 SEWAGE FLOWS

(a) The computation of the design sewage flow for a large sewage system will vary according to the nature of the development to be served. Recommendations concerning design flows are given in Section 9.3.5 and for various building uses are contained Appendices 9.3.1 and 9.3.2. These recommendations are for total daily sewage flows Calculation of peak daily and peak hourly flows will be necessary to determine the design requirements of all parts of the sewage system. Sewage systems should be designed to handle any commonly experienced peak flows.

(b) It is recommended that the sewage system designer discuss the proposed design sewage flows with the approving authority at an early stage, so that valuable design time and costs will not have been wasted if there is significant disagreement on this point at approval time.

(c) If appropriate, an allowance for ground water infiltration should be made where there is a significant collector sewer system. In such cases, guidelines for the computation of peak domestic sewage flows

and infiltration into sewers are contained in the Ministry's "Guidelines for the Design of Water Storage Facilities, Water Distribution Systems, Sanitary Sewage Systems and Storm Sewers", issued in May 1979, which may be applied where appropriate although, in most cases, they are prepared in consideration of larger sewage systems than will be applicable under Part VII.

(d) All non-sewage flows must be kept out of the sewage system including, for example, all storm water, surface run-off and all cooling water wasted from air conditioners. Measures, where practical, should be taken to reduce sub-surface drainage entering the leaching bed, especially where this is a significant quantity after heavy rain.

(e) In residential systems, the design flow per person includes a margin of safety over the average water consumption figures established from various studies. In other circumstances, when metered flows are 7 proposed as the basis for design, it is recommended that a safety factor be applied, unless the system design applies a safety factor in other criteria. Such a safety factor could be applied to peak flows with the amount depending on the acceptability of the metering method used, the reliability of the data, and the length of time over which it was collected.

(f) It is important that all plumbing fixtures are kept in good repair and are selected in the knowledge that water conservation is important, e.g. avoid continuously running drinking fountains, urinals that flush on a timed basis, etc. Sewage system designers should examine existing fixtures and, where the system is associated with new construction, discuss this matter with the building designer.

8 SITE INVESTIGATION

(a) An acceptable location for a large sewage system must meet the general requirements outlined in Article 8.2 with respect to the leaching bed.

(b) Investigation of the site is primarily to obtain data on sub-surface soils, the existence and nature of any rock strata that would affect the system's operation, surface drainage, ground water table and ground water movement, and any effects the project-would have on ground and surface waters.

(c) Hydraulic capacity - Assuming space and suitable conditions are available at the site to meet the requirements for treatment of the sewage (i.e. the tank and leaching bed), the critical consideration will frequently be the hydraulic capacity of the site and its surrounding area. The liquid effluent from the sewage system must not mound under the trenches so as to interfere with the treatment of the sewage and must be transmitted in the soil away from the leaching bed without breakout to the surface. In this connection, it must be remembered that the extent of the soil mantle, specified in the regulation as at least 15 metre beyond the outer distribution pipes in any direction in which the sewage entering the soil will move laterally, is a minimum, and the Director may require this to be increased. The hydraulic capacity can be the restricting factor in such cases as:

(i) A large sewage disposal system having one leaching bed.

(ii) A sewage system in which it is proposed to have more than one leaching bed, to each of which tank effluent is separately delivered, but where the in-ground movement of effluent from one bed may compound with that from another.

(iii) A subdivision, if the flows of all the individual sewage systems, when combined, are in excess of the capacity of the area covered by the subdivision.

(d) ground water protection - Site investigation should examine the effect that the addition of sewage to the soil will have on the ground water quality.

(i) Attenuation of the contaminants should be such that the quality of ground water or surface water will not be impaired to a point where the water quality objectives and criteria contained in the Ministry's publication "Water Management" cannot be met. Typical concerns are the possibility of contamination by bacteria, chlorides or nitrates. For example, nitrate contamination of wells should not result in concentrations in excess of 10 mg/L. Although some nitrogen compounds in the sewage are converted to gas before and after entering the soil, and some are taken up by plants, it can be assumed for safe computation, when considering their effect on ground water, that all such compounds in the sewage are converted to nitrates and that they are only attenuated by dilution.

(ii) In addition to concerns respecting existing uses, such as wells, the potential uses of ground water on adjacent properties should be protected. The effects on ground water quality should be determined within the property and, if required once the attenuation zone is established, at the property line and beyond. The effects should also be assessed at any point where ground water will be coming to the surface or discharging directly or indirectly into a body of water. The quality of the water at such points should be determined before the sewage system is constructed and should <u>not</u> be deteriorated by the operation of the sewage system.

(iii) Wherever possible, a sewage system should be sited down gradient from any wells.

(iv) Particular attention should be given to sewage systems proposed in areas where fissured rock is prevalent at shallow depth.

(e) A hydrogeological study, conducted by a qualified person, may be undertaken to determine hydraulic capacity, or to assess the possibility of ground water impairment due to the proposed

construction, or both. In such a study the stratigraphy of the geologic materials in the saturated zone, together with the permeability (hydraulic conductivity) of the materials, and the quantity, quality and movement of ground water through the area, need to be determined so that the effects of the addition of sewage to the ground water can be assessed. The direction and dimensions of the "plume" of dispersal and the mounding of the leaching bed effluent can be computed. Hydraulic capacity can be assessed and the attenuation of contaminants estimated. Attenuation would include the lowering of concentrations due to the mechanical filtering action of the soil, bacteriological action, ion exchange,, dilution, dispersion and denitrification.

(f) Drainage - Both surface drainage patterns and ground water movement must be determined. The leaching bed location should avoid adverse conditions, or the design provide for the diversion of drainage that would interfere with the operation of the sewage system.

(g) Soils and water table - Chapters 6 and 8 provide guidelines on assessment of the soil characteristics and water table and their influence on design and the acceptability of a proposed location. The investigation should determine the soil types and the permeability of any soil strata which may have an effect on the treatment and dispersal of the sewage. The area over which this investigation need be done, •and the depth to which the investigation of soils and ground water should be carried out, will depend on the volume of sewage to be treated and the site conditions encountered.

(h) The site investigation for large sewage systems should be undertaken by a hydrogeologist or a soils or geotechnical engineer experienced in such matters. The report should be made available to the system designer and included with the application for a Certificate of Approval.

(i) If the water table is considered the limiting factor, and data respecting high and seasonal levels are limited, the Director may require the installation of well points over the site, which are

monitored over a change of seasons, preferably including spring thaw, to produce the information required.

9 DESIGN REQUIREMENTS AND CRITERIA

The regulation provides minimum standards for the design of Class 4 and Class 6 sewage systems. The standards have been established primarily with residential and small commercial sewage systems in mind. It is reasonable that some of the regulatory minimum requirements should be increased for the design of large sewage systems. In some cases, therefore, the requirements and criteria recommended hereunder are in excess of the minimum standards in the regulation. Designers should apply reasonable judgment in selecting criteria so that the design is suited to the conditions prevailing on each project. The following recommendations are made:

(a) Design of large systems should be undertaken by an individual or organization, normally a consulting engineer, who is experienced in the sub-surface disposal of sewage and technically competent to produce plans and specifications for contract action.

(b) Pre-design consultation between the owner, or his consultant, and the approving authority is considered essential, so that any areas of misunderstanding concerning the application of the requirements of the Act, regulations and guidelines can be eliminated, and the require ments of the Application for Certificate of Approval can be clarified. The designer must meet the requirements of any other statutes, regulations or municipal by-laws applicable to the system.

(c) Site investigation is discussed in Section 8. The extent to which it need be carried out will depend on the site and the scope of the project. For example, if experience in the area and a limited amount of investigation, such as boreholes and test pits, discloses good conditions, it may be possible to accept a relatively small project without more extensive investigation. The actual amount of site investigation carried out will depend on the designer's judgement in each case. It must also be sufficient to satisfy the approving

Director. The following is indicative of the scope of site investigation needed:

(i) For a leaching bed in a relatively simple project on a site known to be generally good for sub-surface disposal;

- at least three boreholes should be put down to rock or to a depth sufficient to establish soil conditions, ground water table and the direction of ground water movement.

- test pits to 2.0 metres, or rock, in the area of the leaching bed for visual inspection and sampling of the soil strata.

- sufficient boreholes to 2.0 metres, or rock, in the area of the leaching bed to confirm the uniformity, or otherwise, of the soil conditions over the whole bed area.

- soil testing to determine the percolation time to be used in the design (see Section 6.3.5).

(ii) For larger, more complex projects, or ones in medium to poor soil conditions, the amount of investigation in (i) may be insufficient to establish site acceptability. Further, if during a simple investigation as described above, the conditions found indicate that additional investigation is necessary, it can be expanded. A complete investigation can include:

- Additional testing of soils, on-site and in the laboratory, to confirm their characteristics and the transmissivity of the geologic materials in the saturated zone.

- Sufficient boreholes and investigation to determine the stratigraphy of the geologic materials, both under the leaching bed and in the area of the effluent plume, and the direction of ground water flow, in order to define the shape

of the plume and to assess the attenuation of contaminants. This, combined with the soil data obtained, should be sufficient to compute the hydraulic capacity of the site and to assess the system's effects on ground water quality.

- A determination of existing ground water quality should be made for use as background data, particularly if the Certificate of Approval requires ground water monitoring during system operation.

(d) Site plans should be prepared to show contours at one metre intervals, or at such lesser interval as is required to clearly indicate the site topography. Plans and profiles as required should be prepared to show details such as site investigation data (including test pit and borehole location), the sewage system layout and its relation to structures, wells or springs, surface waters, lot lines and, where appropriate, adjacent land uses. The elevation of all important parts of the system should be shown. If the site is to be significantly altered by grading after the proposed works are approved, and before the sewage system is constructed, site drawings for the site before and after finished grading are required, with the system details shown on the latter. In such cases, unless adequate soil and ground water data for the site after grading can be obtained to the Director's satisfaction prior to the commencement of grading, it will have to be obtained after grading is completed. If this is necessary, the grading will be done at the owner's risk that the data obtained after grading may result in a decision not to approve, the proposed (or any) sewage system.

(e) Dimensioned drawings in plan, elevation and cross section are required to show clearly all parts of the sewage system. These drawings, together with specifications for all equipment and material to be used, should be adequate for contract purposes.

(f) Sewer systems, pumping stations and such related works are to be designed in accordance with the Ministry's Guideines for Sanitary Sewage Systems referred to in 7(c) of this Article.

(g) The leaching bed specifications should include all necessary elements for approval and construction including, but not restricted to:

(i) Specifications for any imported fill or a specified source of fill material.

(ii) Requirements respecting the removal of organic soils and vegetation, and the removal and reuse of top soil.

(iii) A clear description of any naturally occurring soil layers to be retained in the design.

(iv) Specifications respecting the removal of trees and any cutting, filling, levelling, ploughing or scarifying necessary to prepare the leaching bed and soil mantle area to receive fill, and respecting the placing and compaction of such fill. This should include any specific requirements respecting the type and use of equipment, and the construction method to be employed, to ensure the minimun of disturbance to the site during this construction.

(v) Specifications for distribution box installation, absorption trench construction, distribution pipes, pipe gradient, backfilling and surface grading, side slopes on fills, sodding, planting or other anti-erosion measures, and any site grading or ditching to control surface run-off, or to intercept ground water. The latter requirement occurs typically when the leaching bed is located in a shallow permeable soil layer overlying less permeable soil on a sloping site, and where heavy rain soon results in the movement of water down gradient to the leaching bed in the upper more permeable soil.

(h) Leaching bed design shall be in accordance with the regulation and Chapter 8. The design should meet the following requirements:

(i) <u>Layout and orientation</u> - This will depend on the shape (in plan) of the area which is available and suitable for subsurface sewage disposal. The direction of ground water

movement away from the bed is an important consideration leaching bed with its long dimension at right angles to this direction will distribute sewage, and therefore the contaminants, over the widest area with respect to its subsequent ground movement. This will avoid the concentration of flow moving down gradient that would occur if the longest dimension was in line with the direction of flow, and should expose the contaminants to more dilution. Adoption of one orientation or the other will be influenced by the site conditions or, possibly, to avoid contamination of a specific area.

(ii) <u>Clearances</u> - The minimum clearances in the regulation should be increased as required by the nature of the project an the site conditions. Some points to be considered are:

- The clearance from wells, surface waters and property boundaries dictated by the results of the study of the effects of the sub-surface discharge described in Section 8(d).

- The leaching bed and the soil mantle should be kept an appropriate distance from any slope that is unstable, or could become unstable due to the introduction of sewage to the soil.

- The minimum depth and extent of the soil mantle described in Section 10(3)5.(i) of the Regulation should be increased as required once the ground water mounding in the soil under and around the leaching bed has been determined and outflow calculations completed.

(iii) <u>Imported fill</u> - Granular material imported as fill should have a percolation time not less than 4 and not greater than 10 min/cm.

(iv) Design value of "T" - In absorption trench leaching beds the value of "T" of the fill can be used to determine distribution pipe requirements if there is at least 0.6 metres of fill below the absorption trenches. Otherwise the design “T” should be a judgement considering the amount of fill below the trench and the percolation time of the soil below the fill.

(v) Dosing - Leaching beds in large systems are normally arranged in two halves and must be dosed by a siphon or pump(s) if they contain more than 150 metres of distribution pipe. Pumps are normally installed in parallel and connected to the leaching bed in a manner which permits alternate operation of the pumps and the dosing of each half of the leaching bed alternately. The dosing frequency, and therefore the volume of each dose, should be selected so as to meet the flow pattern of the sewage and provide the maximum recovery period between doses. The period of delivery of a dose must not exceed 15 minutes. The minimum volume of a dose must be at least 3/4 of the internal volume of the distribution pipe. The relationship of daily sewage flow to minimum dose volume varies with the design "T" value used to compute the distribution pipe requirements. For example, a given daily sewage flow can be 40 times the minimum dose in a Class 6 sewage system using 3” pipe in very permeable soil (T=2), but only 2 times the dose volume in a Class 4 sewage system in a soil of T=25. For a given volume of dose the sewage must be delivered to the larger bed in a much shorter period of time than in the smaller bed if even flooding of the pipes is to be achieved. This is reviewed in more detail in Articles 8.6 and 8.7 covering dosing and pressure distribution systems. The most important point to achieve is a bed layout and pumping system that will deliver sewage in as equal quantities as possible to each line of distribution pipe. It is more difficult to also achieve even distribution throughout the length of each line of pipe. Methods of achieving reasonably even in-line distribution are outlined in Article 8.6.

(vi) Pipe - All plastic pipe in the sewage system downstream of the septic tank or aerobic treatment plant, including headers and distribution pipe in the leaching bed, should meet the requirements of CSA Standard B182.1-M 1977 and be CSA certified pipe.

(vii) Monitoring - Where the project is of a size or complexity Such that a hydrogeological study has been required, ground water monitoring devices should be installed at points recommended by the consultant so that ground water quality can be tested against the parameters estimated in the design. The Ministry's Regional office should be consulted respecting monitoring requirements and the location of monitoring points.

(i) All parts of the sewage system should be designed in a manner providing protection against physical or environmental damage.

(j) Access for maintenance should be provided to all controls, tanks, compartments, pump or siphon chambers and distribution boxes. Where access to tank manhole openings is provided from the surface by a manhole extension rather than by excavation, the extension or manhole riser, whether constructed on site or precast, should conform (at least in its dimensions) with the Ministry's guide requirements for reinforced precast concrete manholes illustrated in Appendix 9.3.5. Access works should meet all safety code requirements and be designed to be secure against unauthorized access.

(k) Spare area - Space on the property, additional to that necessary to meet the above design criteria, may be required in the following circumstances and should be designated for this purpose on the plans attached to the Certificate of Approval:

(i) Where expansion of the sewage system is foreseen to meet the needs of expansion of the facility served. In such cases, owners and designers must ensure that any future expansion

plans are drawn to the attention of the approving authority in the application for Certificate of Approval.

(ii) In marginal cases where, in the judgement of the Director, a spare area is necessary for the enlargement or replacement of the system should failure occur.

10 MAXIMUM SIZE AND SITE ACCEPTABILITY

(a) There is an upper limit on the size of the sewage system that can be constructed at any given site. This limit may be imposed by:

(i) Space restrictions on that part of the property that is available and suitable for sewage disposal.

(ii) Topography, soil conditions and drainage into and from the area.

(iii) The size and complexity of the distribution pipe layout in a leaching bed. If reasonably even distribution is to be obtained, no element of the bed should be excessively far from the point of sewage entry, and the number of times flow is split by distribution boxes or headers should be limited.

(iv) The hydraulic capacity of the site and its surroundings in any direction of ground water movement. Mounding of sewage after it enters the site should not lead to breakout, or saturate the filtering zone of the bed below the trenches.

(v) Problems respecting ground and surface water contamination.

(b) The problem of achieving and maintaining even distribution of sewage to any leaching bed, or segment of a leaching bed that is separately dosed, has been reviewed in Article 8.6. Section 8.4.8 and Drawing 8.4.2 suggest a maximum size of a leaching bed of 2880 metres of distribution pipe. Obviously, the-distribution box could have more outlets, and each header more connected lines; or a third means

of splitting the flow could be introduced. The designer should remember that even distribution of sewage to all parts of the bec is the objective, and that the layout should be simple to construct and maintain, and balanced around points of entry.

(c) The concerns of hydraulic capacity and possible ground water contamination have been covered in Section 14.1.3(a) and (b) and elsewhere in this Article. As a sewage system increases in size, so will the leaching bed requirements and these two concerns will generally become more restrictive. They are related to the outflow from a single leaching bed, but must also be considered when there is a close grouping of small leaching beds, as in a subdivision, or where more than one leaching bed area is proposed for a single project. In these cases the hydraulic problems and contaminating effects of one bed may compound with those of another unless the siting of the beds, and their dispersal one from the other, keep such "interference" within acceptable limits. Their combined effects must be considered in a hydrogeological study of such a proposal.

(d) Determination of the maximum size of sewage system that a given area or site can sustain is site specific. The question will more often be whether or not a particular project can be accepted on a given site, and the Director may request such professional investigation as is considered necessary in order to make this determination. The extent of the investigation should be decided in discussion with the owner or his representative at the earliest possible date (see 4(c) above). Costs must be kept in mind, and this may lead to a progressive, or staged, investigation. The results from each stage can be discussed with the approving authority to determine the need for more detailed investigation. It should be kept in mind that any subsequent stage of investigation may result in a decision that the site is unsuitable, or cannot be made suitable, for the proposal.

(e) Recommendations on the scope of investigation are outlined in Section 9(c) of this Article. It is recommended that a hydrogeological investigation be carried out in support of any large sewage system where the average percolation time of the soil over the area

of concern, taken at a depth of one metre, exceeds 15 minutes per centimetre, and in all cases where the total daily sewage flow from a subdivision, condominium or other multiple sewage system development exceeds 15,000 litres per hectare, or that to an individual sewage system exceeds 50,000 litres. This recommendation is not intended to limit hydrogeological investigation to such cases only. The decision is up to the Director. In some cases, the prime concern may be the possibility of ground water impairment rather than the hydraulic considerations. It is frequently on sites where soils of high hydraulic conductivity are present that the addition of sewage is most likely to affect off-site water resources.

11 GUIDELINES FOR CONSTRUCTION

(a) It is of considerable importance to the operation and effectiveness of sewage systems of this size that the design approved on a Certificate of Approval is in fact followed in construction. Continuous, or at least sufficient, project supervision should be provided to ensure that this is accomplished. While stressing the importance of good construction supervision, the amount warranted must take into consideration its cost in relation to the contract cost of the project, as well as assessing its need on the basis of the complexity of the design and site conditions.

(b) It is preferable that the professional engineer who prepared the design is also charged with responsibility for calling tenders, reviewing bids for contract award, supervising the construction and preparing as-built drawings sufficient for record purposes. When construction is completed the project supervisor should prepare a statement for the approving Director certifying that the work has been completed to his satisfaction. This certification should include statements from any manufacturers holding warrantees or guarantees on their equipment, that they are satisfied that the construction has not prejudiced their warrantees or guarantees, or showing cause if they have been prejudiced. A package of all relevant design data, "as-built" drawings, warrantees, etc. should be prepared for the owner. Particular attention should be given to

meeting all the conditions in the Certificate of Approval, and to the contractor's workmanship in carrying out tasks for which detailed specifications may or may not have been included, such as:

(i) Delivery of the proper material. While this applies to all material, it is of particular importance that fill delivered to the site is the material required by the design.

(ii) Protection of materials and construction from damage by the elements.

(iii) Adoption of construction methods, and the selection arid use of equipment, that will enable the work to be completed without adversely changing the permeability of the natural or imported soils used in the design.

(iv) Compaction of fill, the bedding of the pipes and the construction of footings for the various parts of the system such as treatment tanks, pump chambers and distribution boxes.

(v) Checking all component elevations and pipe gradients.

(vi) Works to divert surface drainage from the system without harming neighboring properties.

(vii) Final grading, sodding, site finishing and clean-up.

(c) While not directly concerned with the construction of the sewage system, all measures possible should be taken to ensure that before, during and after its construction, the activities of others involved with the project will not damage the site or the system. Such activities include area grading, use of the sewage disposal site by building contractors, spreading on the site of material excavated for building purposes, and use of the sewage disposal site for material storage.

12 GUIDELINES FOR OPERATION AND MAINTENANCE

(a) Prior to the completion of construction, personnel who will be responsible for the operation of the system should be selected and trained. If operating a Class 6 sewage system, it is desirable that the operator have some training in sewage disposal in addition to having the necessary knowledge *of* the settings and adjustments for optimum operation *of* the installed equipment. All system operators should be able to carry out mechanical repairs or parts replacement. All persons in the business *of* servicing and repairing sewage systems are required to have a Class 1 License except as provided otherwise in Section 12 of the regulation.

(b) If the system is a Class A Class 6 sewage system, the owner or operator is required by regulation to have a service contract with a person or company holding a license to service that type of Class 6 sewage system except as provided otherwise in Section 12 of the regulation.

(c) The frequency of visits to the system by the operator will depend on the type and size of the installed system. The recommendations of the manufacturers of both prime and ancillary equipment and controls will be the minimum frequency in each case.

(d) The designer should include, as part of the application for a Certificate of Approval, recommendations concerning operator training, frequency of attention, tasks to be performed by the operators and reports and records to be kept. Any direction on these matters should be included in the Certificate of Approval.

SEWAGE DISPOSAL FOR CAMPGROUNDS AND TENT AND TRAILER PARKS

1 GENERAL

(a) The purpose of this guideline is to review and make recommendations on the application of the requirements of the Act and Regulations to the disposal of sewage in campgrounds and tent and trailer parks used for recreational purposes. It does it apply to construction camps or to such facilities as youth camps or institutional camps.

(b) The term "campground" will be used in this guideline to cover campgrounds, tent and trailer parks, and the term "campsite" or "site" will the space allotted in the campground for the location of one tent or trailer. The types of such facilities, and the selection of sewage systems to serve then, are outlined below.

2 TYPES OF CAMPGROUND AND CAMPSITES

(a) Campgrounds - Most are holiday campgrounds varying from those catering to transient campers and people staying for short periods (e.g. 1 to 3 weeks) to those occupied by families on a seasonal basis. With few exceptions they are not open during periods when freezing conditions are encountered. While campers in the transient and short stay campgrounds utilize a wide range of camping equipment from tents to sophisticated trailers and motor homes, those in *the seasonally* occupied campgrounds are generally in trailers. These may be moved to the site each year or remain over the winter. Once located they are frequently put on blocks for the duration of the stay. A few campgrounds are of *the* wilderness park type used by canoeists and backpackers.

(b) Campsites - Within a campground the campsites may be all of the same type or may be a mixture of types to provide for the variety of campers' equipment and requirements. The two principal types are:

(i) Unserviced sites - These include primitive sites, such as those in a wilderness park, where sanitary facilities are limited to privies, or the bush, as appropriate. Most are sites where the occupants have access to water nearby (e.g. a piped system delivering water to standpipes throughout the campground) and to a variety of communal facilities ranging from pit or vault privies to well equipped central comfort stations.

(ii) Serviced sites - Such sites normally have power and water connections and may have a sewer connection. The campground may also provide central comfort stations with the result that some of the waste generated by the occupants may be treated by the sewage system at the comfort station and some by a separate sewage system, depending on the facilities provided and other factors.

3 CENTRAL COMFORT STATIONS

Most modern campgrounds have one or more central comfort stations in which there will be toilets, wash basins and probably showers for each sex. Sane central comfort stations may also provide one or more clothes washers and dryers. When sewage disposal is to a Class 4 or 6 sewage system, the number of washing machines installed should be limited. Generally, washing machine waste (Appendix 9.3.1) should not exceed 20% of the total daily sewage flow in the sewage system (see Section 5.1.3).

4 WATER SUPPLY

In most campgrounds except the wilderness parks, some form of communal water supply is available to the campsites. Commonly, this is a piped supply with water available from standpipes located at intervals throughout the campground. Some trailer sites have water connections at the site. The water supply is normally from wells. Sate trailers have their own water tanks and the occupants may use water from these tanks during their stay.

5 SEWAGE DISPOSAL METHODS

The disposal of sewage may be carried out in a variety of ways ranging from direct disposal (no sewage system) to collection by a communal sewer system and disposal in a centrally located sewage system. The principal options are outlined below with comments:

(a) Direct Disposal

(i) All camsites except sites in wilderness parks - Disposal of human waste other than to an approved sewage system is not permitted. Grey water should be disposed directly to a sewage system or collected in some form of container from which it can be deposited in a sewage system. Waste from trailers shall not discharge to the surface of the ground. If no sewer connection exists such waste must be retained in the vehicle tanks until removed by a pimp truck or discharged at a sanitary dumping site. The disposal of any grey water on the ground surface should be discouraged. Even at well separated tent sites in an area of pervious upper soils it is preferable to provide a sewage system for disposal of grey water, although quantities may be small. See also subsection 7(a) below and subsection 13(1) of the Environmental Protection Act.

(ii) Primitive sites in wilderness parks - Direct disposal of human waste and grey water may be accepted in the vicinity of campsites in such parks providing soil conditions are favourable. While, surface disposal may be difficult to prevent, campers should be encouraged to adopt the shallow excavation and backfill method. In sites which are frequently used as overnight stops pit privies and, if required, Class 2 sewage systems should be constructed and maintained by the park authorities.

(b) Disposal in a sewage system - Comments on the use in campgrounds of the sewage system outlined in the regulations are provided below. The standards in the regulation shall apply.

6 CLASS 1 SEWAGE SYSTEMS

Privies used in campgrounds shall meet the requirements of the regulations. In addition, they should not be located closer than 15 metres to a camp space or a building used for human occupancy. The number of privies provided should be in accordance with the guidelines issued by the Ministry of Health.

(a) Pit privies may be used where soil and water table conditions permit. The use of multi-seat units, centrally located to serve a good number of campsites, is not considered as advisable as locating single seat. privies in greater numbers throughout the area. If this is done the occupants of a campsite may consider the nearest privy to be more like their "private" toilet. To encourage this feeling, and therefore promote in the users a concern for its cleanliness and for those that follow, it is recommended that the interior of the structure *be* finished in material that is easy to clean and that a toilet seat and lid and a toilet paper holder be provided. The units should be inspected daily to insure that sanitary conditions prevail.

(b) Vault privies may be used in the sane manner as pit privies. They are more acceptable than pit privies when a multi-seat unit is contemplated. The structure in which they are housed can also contain urinals and hand wash basins. Units should be well ventilated and pumped out as required. Vault privies should only be authorized where there is an acceptable pump out and disposal system (Class 7) on a continuing basis, preferably to a sewage system within the campground. Septic or aerobic tanks receiving pump-out from vault privies must be sized for the higher daily sewage flows (in brackets in Appendix 14.2.1) due to the concentration of solids in the sewage.

(c) Other types of Class 1 sewage systan are not considered suited for use at campgrounds. The exception may be large composting toilets. The principal objection to their use is that the users would not exercise the same control over such toilets as they would in their own residence, with the result that non-biodegradeable materials may be disposed of in the toilet.

2 CLASS 2 AND 3 SEWAGE SYSTEMS

(a) Class 2 sewage system - The use of these systems for grey water disposal is acceptable with limitations (see below) providing the soil and ground water conditions permit compliance with the standards. They may be located at or near campsites as a means of disposal of small quantities of grey water. Grey water can be poured into the system from containers by means of a pipe with a funnel shaped entrance of sufficient capacity to avoid spills. The connecting pipe should be not larger than 1½" trade size and the dumping site signed to indicated its purpose and to advise against the disposal of toilet waste. Trailer sewage connections should not be made directly to a Class 2 sewage system due to the possible overloading of the system due to the piped water connection and the difficulty of exercising positive *control on* the trailer discharge to ensure that toilet wastes are excluded from the system.

(b) Class 3 sewage systems - These system are not a practical installation for a campsite.

8 CLASS 4 SEWAGE SYSTEMS

These system are practical for use in connection with comfort stations and clusters of sites. The regulation stipulates the minimum size of a septic tank and the minimum mount of distribution pipe to be used in a class 4 sewage system. Their use at each site is uneconomical as the capacity of the smallest system permitted far exceeds the volume of sewage produced on site. Some design considerations are:

(a) Sewage from recreational vehicles (e.g. trailers, campers, motor homes) will be more concentrated (respecting BOD_5, suspended solids and other constituents) than household sewage due to the relatively low water flows from the fixtures. This matter is previously discussed in Section 9.3.6(b) (i). It should be taken into account in sizing septic tanks in systems serving comfort stations where water saving devices are used, and in those serving clusters of campsites.

(b) Basic design daily sewage flows per campsite are shown in Appendix 14.2.1 and are also shown with the general recommendations on sewage flows in Appendix 9.3.1. The figures in brackets are the larger flow values that should be used in the sizing of septic tanks and aerobic package plants to compensate for the high solids content of the sewage originating in recreational vehicles due to the relatively small water usage of the fixtures in such vehicles compared to those in a home (on which the standards in the regulation are based). Assuming 2 days retention in a small septic tank (capacity not exceeding 4500 L), the maximum number of campsites which could be connected by sewer to the tank can be determined by dividing one half of the tanks working capacity by the sewage flow shown in brackets for one site. For example, a 3600 L septic tank could be connected to 9 sites (1800/200=9) when a comfort station with toilets and hand basins is available, but only to 4 sites (1800/425=4.23) when there is no comfort station.

(c) For leaching bed design, advantage can be taken of the smaller than normal volumes of sewage flowing from fixtures in a trailer or motor home, but not beyond the recommendations in section 9.3.6(b) (ii).

9 CLASS 5 SEAGE SYSTEMS

The general policy on the use of holding tanks is outlined in section 11.1.4. Their use for sewage disposal at campgrounds should be discouraged for the reasons outlined in that section. If they are permitted, the following comments are made respecting their use under the circumstances found in a typical campground:

(a) Holding tanks of the minimum capacity of 9000 litres, permitted by regulation are uneconomical for use at each site and are best used to serve clusters of sites.

(b) The use at each site, or group of sites, of a holding tank of smaller capacity may be authorized at the Director's discretion. A Class 7 sewage system must be available to pump out *the* tanks and dispose of the sewage. Disposal methods are covered in Chapter 13. Preferably, the Class 7 sewage system should dispose of *the pumped* sewage to a sewage system (Class 4 or 6), or other disposal method, within the campground property, and for new construction, this should be the rule. Tanks in a Class 4 or 6 sewage system receiving pump out must be designed for *the* higher daily sewage flows (in brackets in Appendix 14-2-1) due to sewage concentration.

(c) The normal requirements for alarm system may make a tank at each site uneconomical. If the Director approves, on-site tanks may be installed without individual electrical alarm system as long as a visual depth indicator is installed and the campground operator maintains a routine check of the depth of sewage in each tank and provides for pumping of the tanks before they are full. If authorized, this requirement should be made a condition on the Certificate of Approval.

(d) The adoption of on-site holding tanks should be assessed against the option of using the tank truck to empty the recreational vehicle's tanks directly.

<u>10</u> CLASS 6 SEWAGE SYSTEM

The use of Class 6 sewage system is similar to that of Class 4 sewage systems. As in section 9 above, the capacity. of the proprietary aerobic treatment plant must be adequate for the solids and BOD_5 concentration to be treated. *The* higher figures in brackets in Appendix 9.3.1 should be used to determine the working capacity of *the* aerobic plant. Leaching beds may be sized in accordance with section 9.3.6(b) (ii).

11 SANITARY STATIONS

campgrounds providing space for recreational vehicles require a sanitary station where these vehicles can discharge their sewage tanks. The sanitary station, or dump site, requires a concrete apron, which has a positive slope from the outer edges to the drain to receive the sewage. The apron should be designed to avoid spillage to the surrounding area. A water supply and a hose are required to permit flushing of the vehicle's tanks and wash down of the concrete catchment after use. The dumped sewage may be led to a Class 4 or 6 sewage system constructed at the site or be taken by a sewer to such a sewage system located elsewhere in the campground. If connection to a Class 4 or 6 sewage system is not possible, it can be temporarily retained in holding tank at the station and removed by a Class 7 sewage system for disposal, preferably within the campground. Some specific design recommendations are:

(a) The drain riser should be at least 4" nominal diameter. The inlet should be capped and protected from damage by vehicle wheels.

(b) The flushing water hose should be reel or tower mounted to assure sanitary storage when not in use. An atmospheric vacuum breaker should be installed at the highest point on the reel or tower in the water supply line to the hose. This point should be located on the tower at an elevation above that of any tanks being flushed, and downstream of any shut off valve at the station. The water outlet should be marked "THIS WATER NOT POTABLE-USE FOR FLUSHING TANKS AND CONCRETE SLAB ONLY" or sane equivalent notice.

(c) sanitary station should be located so that the drain is at least 30 metres from any campsite or building used for human occupancy and maintains the same clearances as required by regulation for the distribution pipes in a leaching bed.

(d) Details of a typical sanitary station are shown in Drawing 14.2.1 (see note at the end of this Article). The drawing shows no trap in the connection (see also comment in section 14.2.15 concerning the need for a trap in the sewer connection.)

12 SEWERED SITES CONNECTED TO A CENTRAL SEWAGE DISPOSAL SYSTEM BY A COLLECTING SEWER

A decision to construct a sewer system to connect all sites in a campground, or segment of a large campground, to a central sewage disposal system. (e.g. at the comfort station) should be approached with caution. Sate factors and considerations influencing this decision are:

a) Site Conditions - Campgrounds are frequently located along a shoreline with little or no grade between the most remote campsite and the sewage treatment plant with the result that lift stations may be required. Gravity sewers will be costly to install in areas where rock is prevalent or the water table is high. Extensive gravity collection systems should only be constructed where the above-noted adverse conditions are not present. Alternatively, these conditions may be overcome by the use of low pressure sewers using mall diameter, shallow buried pipe.

(b) Occupancy - Occupancy in many camps is variable due to the weather and other influences affecting the number of users. This can result in sewage flows being inadequate to flush the sewers in an area of sparse occupancy and is a disadvantage unless, under such circumstances, the management can close such areas of the camp in order to maintain as full occupancy as possible in the remaining portions. The sewage flow from each site can also vary depending on the type of unit occupying the site at the time. Occupancy may vary from a tent or tent trailer to a large fully equipped trailer or motor home. A collecting sewer system is only practical for sites set aside for trailers or motor homes, and they are more common in the seasonally occupied type of campground.

c) Sewers - Where adopted, collecting sewers and connections to each site should be designed by a professional engineer or other qualified person in accordance with the Ministry's Guidelines for the Design of Sanitary Sewage Systems. The depth of burial should be appropriate to the seasonal use of the campground. The installation should provide for ease in flushing and cleaning the sewers.

13 SEWERED SITES CONNECTED DIRECTLY TO A SEWAGE SYSTEM

(a) Where fully serviced sites are desired, and there are disadvantages to a collecting sewer systems serving the whole development, it may be practical to have several separate sewage systems, each connected to a "cluster" of sites. The number of sites in a cluster will be dictated by factors such as site size, topography and soil depth. Direct connections from each site to the tank would make each site independent of the others, but the number will be limited by the number of baffled connections that the tank will accommodate at the inlet end (probably no more than 3) and *the* location of the sites relative to each other and to the tank. Short *lengths of* collecting sewer may be required where more sites are connected.

(b) From each site connection *the* sewage would flow by gravity to the tank (septic, aerobic or holding). The size of the system would depend on the daily sewage flow from *the connected* sites.

(c) Septic tanks should be selected from the sizes required by regulation for dwellings, unless a larger size is required.

(d) For Class 4 or 6 sewage systems, *the* leaching bed may be close to *the* treatment tank or a pump chamber provided to transport *the* effluent to another location. This may be to a leaching bed exclusive to *the* sewage system, or one sized for common use with other sewage system. For most campgrounds (not open in freezing weather) the forcemain can be shallow buried.

14 SEWAGE FLOW

(a) Daily sewage flow recommendations for sites in various circumstances are contained in Appendix 14.2.1 (Principal recommendations are also included in Appendix 9.3.1). These recommended design flows are derived from an estimate of the sewage flows (i.e., water usage) that could be expected from various campground activities, and from the

application of these values to the various types of site normally installed at campgrounds. Various assumptions have been made in developing the flow recommendations. Should some of these not apply to a specific application, the Director may use judgment in assessing the requirements for a certificate of approval. The assumptions made, with comments, are as follows:

i) Each site is assumed to have 3.5 occupants.

ii) One shower is taken per day per person at the comfort station, if available (abut 25 L per shower), or in the recreational vehicles at trailer sites (10 L per shower).

iii) 5 visits per person per day to the toilet. For trailer sites with sewer connections assume 3 per day at the =fort station (each 20 L) and 2 per day in the vehicle (each 2 L). Assume 5 per day at the comfort station for sites there no sewer connections are provided.

iv) Grey water due to washing and cooking will be generated at all sites with or without sewer connections.

v) No allowance made for any period of the day when site occupants are away from the campground

vi) That all recreational vehicles occupying trailer sites are fully equipped with toilets and showers. No allowance is made for such sites harbouring vehicles that are not so equipped (e.g. toilet but no shower).

vii) That comfort stations are either fully utilized by the occupants of nearby sites, or are non-existent or so <u>remote</u> as to be useless by such persons. Partial use situations & do exist as, for trailer sites, the proportionate use of

facilities in the comfort station and those in the vehicle will vary with the weather, distance to the comfort station, crowding of the comfort station and other factors.

(b) If design daily sewage flows are based on metering the Director must be satisfied that the results obtained are applicable (see section 9.3.5(c)). to be valuable the flows should be measured daily and be taken over a period of sufficient length to include peak occupancies. A concurrent daily record of site occupancy and the actual number of occupants per site should be kept. For sites with sewer connections the type of vehicle and its installed fixtures should also be recorded. When the use of metered results from another campground in proposed, the Director should be satisfied that conditions are similar in all related aspects.

15 SEWER CONNECTIONS AND CLEANOUTS

All connections at campsites, sanitary stations and sewer line cleanouts should be capped when not in use. Typical site connections for water and sewer are show in Drawing 14.2.2 (see note at the end of this Article). No trap is provided as the inclusion of a trap in the connection is questionable. Traps in the vehicles will prevent odours entering the vehicle when connected, negating the need for a trap in the connection to serve this purpose. Unless traps can be installed in a manner which permits easy access for servicing, they should be omitted as, without a trap, sewer cleaning and flushing is simplified.

16 SUMMARY

(a) There are a variety of ways in which sewage disposal can be handled at a campground. The appropriate solution depends on:

i) The nature of the campground which may range from a wilderness camp to one of such permanence that the Director may consider it to be more like a "mobile home" or "cottage" development.

ii) Location, topography and soil conditions.

iii) Seasonal or multi-seasonal use.

iv) The -size and layout of the campground.

(b) The types of sewage system most adaptable to serve campgrounds are:

i) Class 4 or Class 6 sewage systems serving comfort stations and any sites connected by sewer to the sewage system.

ii) Class 4 or 6 sewage systems to serve clusters of sites having water and sewer connections. Leaching beds for such systems may be close to the septic or aerobic tank or may be remote.

iii) A sewage system in which the effluent from septic or aerobic tanks, each serving several sites, is delivered by a low pressure pumping system to a remote leaching bed. This may be the leaching bed serving a comfort station, in which case, it must be sized accordingly.

(c) Sewage systems which have limited application in campgrounds are:

(i) Class 1 sewage systems to provide for human waste disposal in areas remote from a comfort station, or instead of a comfort station. Pit or vault privies are the most suitable, the choice depending in part on soil conditions and, in the case of vault privies, the availability of a means of disposal of the pump out in the campground area. Other forms of Class 1 system are not recommended.

(ii) Direct connections to Class 2 sewage systems should not be used at sites with water and sewer connections. Their use should be limited to providing for the disposal of small quantities of grey water for a group of sites, or at sites which do not have water and sewer connections.

(iii) Class 5 sewage systems should be used only where Class 4 or 6 sewage systems are impractical. They may serve individual sites or a cluster of sites having water and sewer connections. Tank size may be smaller than regulation if approved by the Director. Alarm systems, or where electrical alarms are not installed, a visual level indicator combined with a systematic inspection of sewage levels the campground maintenance staff, are necessary to ensure timely emptying of tanks. Alternatively, the pump out vehicle could empty recreational vehicle tanks directly.

(d) A Class 7 sewage system, operated by the campground or contracted, will be required to:

(i) empty the holding tanks of recreational vehicles when no sewer connections are provided as an option to use of the sanitary station;

(ii) empty any Class 5 sewage systems or vault privies installed.

(iii) pump out septic or aerobic tanks and pump chambers when required under normal maintenance.

(e) Connection to a Class 4 or 6 sewage system is normal at sanitary stations. A less desirable option is use of a Class 5 sewage system.

(f) Sewage collection systems are generally limited to cases where:

(i) Site occupancy is by fully equipped trailers or motor homes.

(ii) Occupancy is fairly consistent and not of short duration.

Note: Drawings 14.2.1 and 14.2.2 are included with the permission of Mr. Bruce Howard, Vice President, the Recreational Vehicle Industry Association, Chantilly, Virginia ((703) 968-7722).

DESIGN DAILY SEWAGE FLOWS (LITRES) FOR VARIOUS TYPES OF CAMPSITE

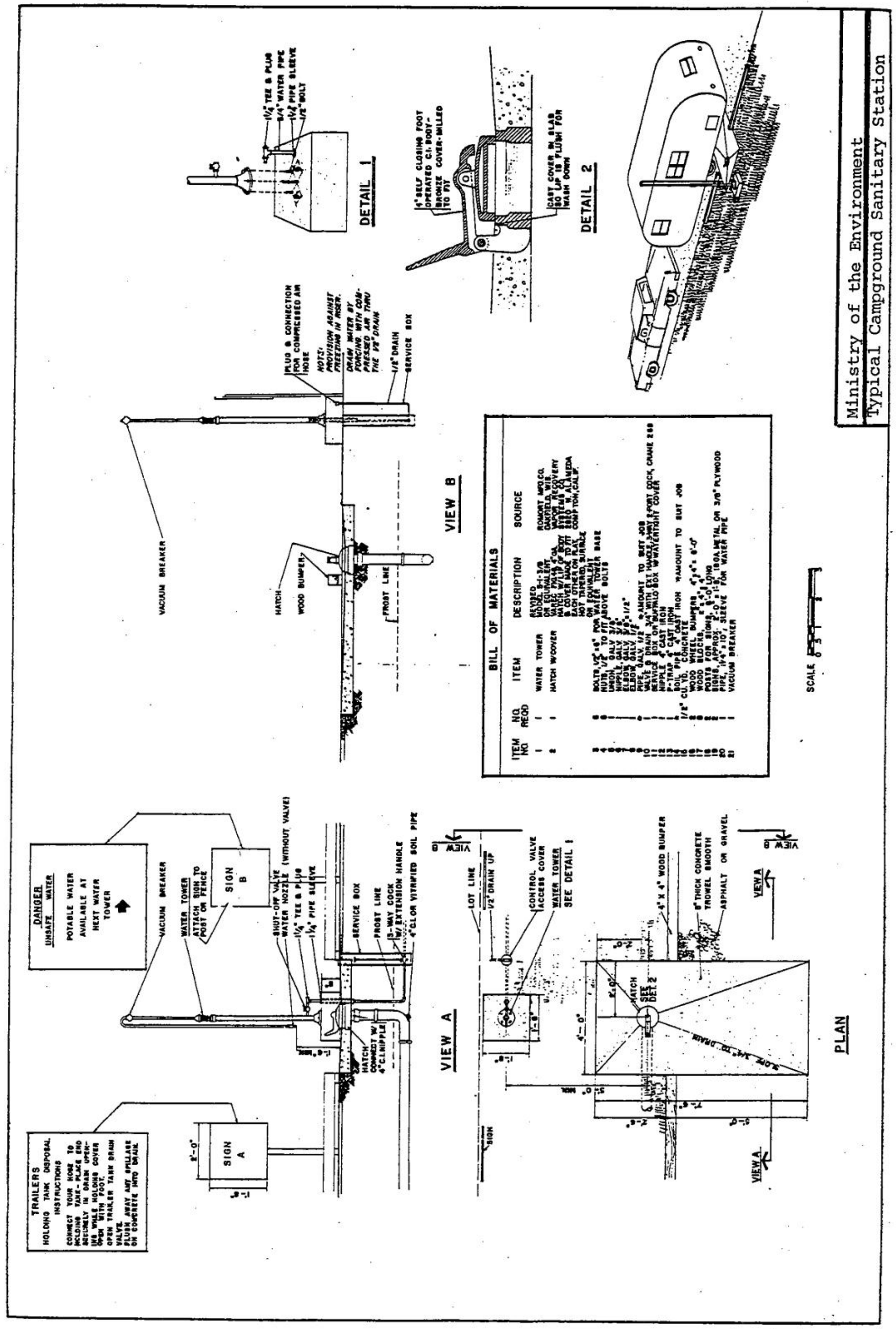
TYPE OF SITE AND USE	DESIGN DAILY SEWAGE FLOW (LITRES) PER SITE (3.5 PERSONS) - NOTES 1 & 4		
.CS = Comfort Station .SS = Sewage System .TRL = Trailer .MH = Motor Home	COMFORT STATION FULLY UTILIZED (NOTE 2)		REMOTE CS OR NO CS (NOTE 2)
	TOILETS, BASINS & SHOWERS (TBS)	TOILETS & BASINS ONLY (TB)	
1. Water and sewer connections. Sewer leads to SS at CS.	425 (525)	375 (475)	CS(TBS) 200(450) CS(TB) 125(425)
2. Water and sewer connections. Sewer leads to SS other than SS at CS.			
a) Sewage generated at CS.	375	275	
b) Sewage to connected SS.	60 (150)	100 (200)	125 (425)
3. No sewer connection. Water connection or standpipe nearby.			
a) TRL and MH sites.			
i) Sewage at the CS.	375	275	
ii) Sewage to veh. tanks	60 (150)	75 (175)	100 (400)
b) Other sites.			
i) Sewage at the CS.	375	350	
ii) Grey water to nearby Class 2 SS or to SS at CS.	15	15	25
c) CS is a vault privy with hand basins & associated Class 2 SS.			
i) TRL and MH sites			
. sewage at the CS		10 (100)	
. sewage to veh. tanks		75 (250)	100 (400)
ii) Other sites			
. sewage at the CS		15 (150)	
. Grey water to nearby Class 2 SS		25	25
iii) Class 2 SS at CS (for basin waste)		25	

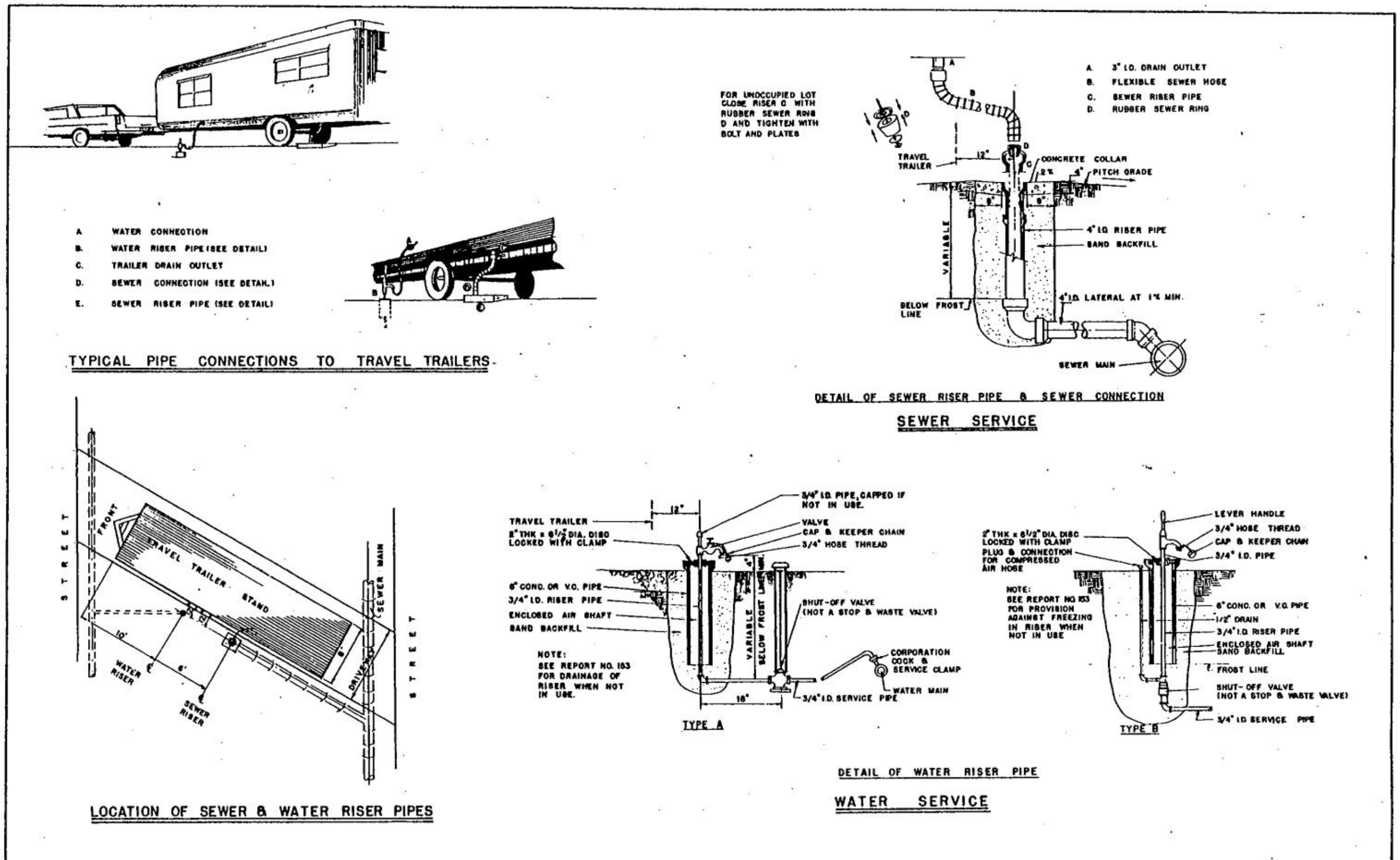
NOTE 1: Sewage flows in brackets are estimated flows adjusted to compensate for concentration of solids and should be used for sizing septic tanks or aerobic treatment plants. Based on 10 times estimated toilet flows and 1.5 times grey water flows in TRL's and MH's.

NOTE 2: "Fully utilized" means a comfort station close enough to the site for easy access and no other factors limiting full use. "Remote" implies limited use by site occupants due to distance from site, overcrowding, etc.

NOTE 3: Flows to vehicle tanks can be used to assess pump-out quantities or sanitary dump site loadings.

NOTE 4: No allowance has been made for "average" occupancy as the sewage systems must function when the campground is full. No safety factor has been included above estimated quantities. No deductions have been made to compensate for time when site occupants are absent from the campground (or the site) during the day or part thereof.


Ministry of the Environment
Typical Campground Sanitary Station
DETAIL 1
DETAIL 2
VIEW B
VIEW A
PLAN
BILL OF MATERIALS
SIGN A
SIGN B
DANGER
UNSAFE WATER
POTABLE WATER AVAILABLE AT NEXT WATER TOWER
TRAILERS
HOLDING TANK DISPOSAL INSTRUCTIONS
VACUUM BREAKER
WATER TOWER
SERVICE BOX
FROST LINE
HATCH
WOOD BUMPER
LOT LINE
SCALE



Ministry of the Environment

Typical Campsite Sewer Connection

15

CHAPTER 15
ASSESSMENT OF LAND FOR
PRIVATE SEWAGE DISPOSAL SYSTEMS

CHAPTER 15

ASSESSMENT OF LAND FOR PRIVATE SEWAGE DISPOSAL SYSTEMS

POLICY FOR ASSESSMENT OF NEW LOTS AND FOR NEW CONSTRUCTION ON EXISTING LOTS

1 DEFINITION

For purposes of this policy, a new lot shall be taken to mean a lot in an application for land severance under Section 29 of The Planning Act, or one in an application for subdivision under Section 33 of The Planning Act or under The Public Lands Act, while an existing lot shall be understood to be a lot on which new construction is proposed and which does not require an approval under the aforementioned Acts.

2 NEW LOTS - ASSESSMENT OF APPLICATIONS

(a) The intent of the assessment is to conduct a review of a subdivision or severance proposal to the extent necessary to submit a recommendation to the approving authority (Ministry of Municipal Affairs and Housing, Regional Government, Committee of Adjustment, or Land Division Committee). with respect to the suitability of each lot in the application for on-site subsurface sewage disposal considering:

- (i) Soil characteristics and depth of soil.
- (ii) The prevalence of rock.
- (iii) The maximum elevation of the ground-water table.
- (iv) Surface drainage and flooding potential.
- (v) The topography, particularly the degree of slope.
- (vi) The standards for the sewage system on which the inspection is based.

(b) To be acceptable a lot must have within it an area which is suitable in all respects in its natural state for subsurface sewage disposal, or which could be made suitable for a leaching bed by reasonable improvements such as leveling, adding fill, etc. The suitable area 7 should be generally within the permissible slopes. The amount of cut or fill required to prepare the area for leaching bed construction

should not be extensive.. The construction necessary should not have an adverse effect on the property, or on adjoining properties. In most cases where the poor site conditions need improving, the leaching bed will be constructed in whole or in part in imported fill and be partly or wholly raised above normal ground level. The term "reasonable improvements" implies that an improvable area exists. Except as noted in (h) below, lots on which no such area exists, and where one could only be constructed by extensive work to reshape the lot, should be considered unsuitable.

(c) A suitable sewage disposal area is one that provides an area of sufficient extent in which to construct a sewage system to the standards required for the system, considering the site and sub-surface conditions. If, in order to meet the requirements of the regulation, the leaching bed must be constructed in imported fill, the regulation lays down requirements respecting the upper layers of soil that will be under the fill and surrounding the bed. It also specifies the quality of the fill material in relation to that of the soil on which it is placed. These and other requirements affect the size of the suitable area as follows:

(i) The upper permeable soil layer, or mantle, covers the area under the leaching bed, but also extends for at least 15 metres beyond the outer distribution pipes in any direction in which the effluent from the bed will move in the soil away from the bed. In a flat site this may be all around the bed.

(ii) The soil mantle must be added if the upper soils are unacceptable as a mantle, and may be added if the natural upper soils are not suited for receiving the type of fill available. Any added soil should be contained within the property on which the building served is located. All added soil must be stablized by planting or other means.

(iii) The depth and extent of the mantle should be adequate to prevent breakout of the effluent to the surface, or the creation of mushy conditions that could cause a public health nuisance. The adequacy of a natural soil mantle depends on its depth, the soil permeability, the ground slope and the relative quality of the material available

as fill. If the regulation prevents the placing of the available fill directly on the natural soil, it will be necessary to import fill for construction of the mantle as well as the leaching bed itself.

(iv) The best orientation of the leaching bed affects the suitable .area as it is desirable to have the longest dimension transverse to the slope.

(v) Any ditching or drainage works to divert surface or subsurface drainage from the area of the leaching bed and the disperal area should be contained within the property boundaries.

(d) Spare Area - If the site conditions and the proposed property use so warrant, the inspector may consider it necessary that an area be provided, in excess of the "suitable area" requirements in (c) above, as a safety factor that will permit extension or replacement of the system should problems be experienced or failure occur. The requirements of such a "spare" area would be similar to those for the "suitable" area. In assessing new lots, allowance for spare area should only be made on those lots where it is deemed essential. Examples may be housing lots on which marginally acceptable site conditions are found, or in subdivisions or severances proposed for commercial or industrial projects, where information on sewage flows and the development of the property is not known in sufficient detail when the application is reviewed. Spare areas for this purpose should not be confused with areas deliberately set aside for sewage system expansion that is forecast to be required at the time of approval, e.g. when only part of the sewage system is constructed with the first phase of a large building development.

(e) Clearances - The minimum clearance distances (including modifications where raised beds are used), bed dimensions, fill slopes and requirements regarding fill are contained in the regulation. When a raised leaching bed is required, the following is recommended in addition to the minimum requirements:

(i) That, where dispersal is primarily lateral rather than downward, it is desirable to contain the entire dispersal area outlined in (c)(i) within the property boundaries, whether the soil mantle is natural or added.

(ii) That fill slopes be set to ensure stability should the minimum 2:1 slope be too steep for the fill material used.

(iii) That all drainage works referred to in (c) (iv) be contained on
the property.

(iv) That unstable soil areas be avoided.

(f) Registration on Title - if there is only one portion of a lot which provides a suitable area as described in (c), and the clearances in (e), the recommendation to the approving authority should be to require the subdivider to include in his agreement with the municipality a scale drawing of each lot so affected, showing the designated area thereon, and a statement requiring that such areas be designated for sewage disposal only. If conditions on the site would require this area to be more extensive than one meeting the minimum requirements of a suitable area as outlined in then a spare area may be included in the designated area at the inspector's discretion.

(g) Minimum Lot Size - The Ministry bases the adequacy of a proposed lot for on-site sewage disposal on the sewage system standards, the criteria for satisfactory sub-surface disposal for the conditions encountered, and the protection of water supplies. The influence of the sewage system requirements on lot size will vary according to the topography and site conditions on each lot. In addition, the method of water supply, communal or individual wells, has a strong bearing because of the clearances required between sewage systems and well on both the lot under consideration and on neighboring lots. Municipal planners preparing official plans and zoning by-laws consider other factors which lead to requirements for lot size that cannot be substantiated on the basis of sewage disposal along. For example, lots of about 1 hectare are frequently required by planners where estate-residential housing is proposed. Sewage disposal considerations will generally not support a lot of this size unless the site conditions and topography are unusually adverse. If they are particularly bad, on-site water supply is proposed, a hectare may be too small. It is not up to the sewage system authority to justify the need for space for swimming pools, tennis courts or other such facilities frequently constructed with such residences, or subsequently added. But the very nature of such estates, and the need for flexibility in property development, may suggest that a larger than normal sewage disposal area, and perhaps a spare area, be required.

(h) Major Land Restructuring - If a subdivision proposal includes major reshaping of the land, such that an inspection for sewage disposal should be deferred until such time as the general area grading has been completed, the developer should produce evidence with his application that will show the potential acceptability of the soils that will be on or near the surface after regrading is completed.

3 NEW LOTS - SEWAGE SYSTEM STANDARDS AS A BASIS FOR ACCEPTANCE

(a) The decision as to the sewage system, the standards of which will form the basis for the review of new lots for acceptance or rejection, will be up to the agency having authority for the implementation of the private sewage program. The decision includes judgment based on local circumstances and experience and the degree to which flexibility of future choice is required. For example, a decision to require that each lot contains a suitable area for a Class 4 sewage system would provide the eventual lot owner with an option to use either Class 4 or Class 6 system as the Class 4 system would normally require more area for sewage treatment than a Class 6 system. A larger suitable area also provides some flexibility in the size of the dwelling and its location on the property. Should problems be experienced, there would be more space on which to construct an alternative system. On the other hand, the desire to provide housing at lowest cost requires the maximum use of land and may lead to the acceptance of lots on which only Class 6 systems could be constructed.

(b) Legal Aspects of Lot Assessment -

(i) The legal purpose of an assessment of proposed new lots is to give advice to the person responsible for granting approvals in the Ministry of Municipal Affairs and Housing, Municipality, Land Division Committee or Committee of Adjustment.

(ii) A recommendation for approval should include any terms related to the recommendation. Reasons should be provided for such terms, particularly where the advice is for rejection. The person receiving the advice may accept it, reject it, or modify it.

(iii) The person giving the advice in the case of an application under Section 33 for a plan of subdivision, may appeal if the advise is not followed. The appeal would be made to the Ontario Municipal Board (OMB). An exception is that no appeal is possible in the case of a consent by the Minister of Municipal Affairs and Housing once given, as there is no appeal unless some prior notice stating the intent to adopt the recommendations or otherwise is given by the Minister of Municipal Affairs and Housing. In the event that an applicant for approval of a new parcel does not accept a rejection, or does not agree with a condition, he may appeal to the OMB. Therefore, any person making a recommendation should make sufficient notes and records to be able to justify his recommendation at an OMB hearing, based either on a prospective violation of 0. Reg. 374/81 or other acceptable grounds.

(c) The following policy is recommended to the authority delivering the program.

(i) Assessment of a new lot should be based on the requirements of a Class 4 or Class 6 sewage system for a 3 bedroom house, unless a larger structure is proposed or probable. Assessment on the basis of other sewage systems should not be permitted, except that a Class 5 sewage system (holding tank) may be used as a basis for assessment where the Director reporting to the approving authority can be satisfied that its proposed use is temporary in nature pending connection to sewers, or where the proposed land use is for a special commercial operation not suited to the use of a Class 4 or 6 system.

(ii) Each lot should have a suitable area for sewage disposal as outlined in 2(c) and (e) for the sewage system selected. Any special requirements respecting lot improvements are made known to the approving authority normally by recommending that the subdivider enter the lot requirements in his agreement with the municipality, or the Ministry of Municipal Affairs and Housing, required under the Planning Act, which agreement will be registered on Title.

(iii) Additional area requirements for expansion, or for a spare area if considered essential, should be based on an assessment discussed in 2(d), and can be added to the special lot requirements in the recommendations.

(iv) In a restrictive lot with only one suitable area the special requirements discussed in 2(f) can be included in the recommendations for inclusion in the subdivider's agreement with the municipality.

(v) An applicant may specifically propose the use of Class 6 sewage systems, or the use of filter type leaching beds with either Class 4 or 6 sewage systems, in order to keep the space requirements for the sewage systems to a minimum. If the inspecting agency agrees, and carries out the inspection of the new lots on the basis of appropriate standards, this should be made clear in the subdivider's agreement which is registered.

4 EXISTING LOTS - NEW CONSTRUCTION

The basic principle to be followed is that the sewage system authorized should be capable of treating the sewage from the building served when that building is fully developed. If the sewage system initially installed is other than a Class A or 6 system, an area for one of these types of sewage system should be available. An exception would-be where the approving authority agrees to the acceptability of a Class 5 sewage system. The following recommendations are made:

(a) Both Class 4 and accepted Class 6 systems are considered suitable and appropriate for the full development of a home or other building, and should be the systems approved with new construction in most circumstances. In addition to the exceptions noted below for Class 2 and 5 systems, acceptance has been given to the Ministry of Natural Resources (MNR) to permit construction of cottages under their Cottage Lot Program with Class 1 and 2 systems, providing the lot is suitable with reasonable improvements, for upgrading of the sewage systems if required.

(b) When a spare area is required, it should be described on the Certificate of Approval and consideration should be given to including a condition in the Certificate requiring that this area be reserved for this purpose and that the owner register a signed copy of the Certificate on the title of the property and agree to draw attention to the requirement in any offer of purchase and sale.

(c) Class 2 Systems - Class 2 systems are not considered adequate for the disposal of waterborne sewage from a building having a fully developed water system and appliances. Buildings that have been constructed with a Class 1 sewage system for human waste and a Class 2 sewage system for the remaining sewage are frequently upgraded at a later date by improvements to the building and to the water system. Improvements may include the installation of such fixtures as baths, showers, dishwashers and washing machines that will affect the operation and effectiveness of the Class 2 system. The general policy is therefore not to approve a Class 2 system with proposed new construction. Exceptions can be made at the Director's discretion when the water consumption is low because there is no pressure water supply, or when a piped supply serves only such fixtures as the kitchen sink and hand wash basins, and where it is unlikely that a pressure system with fixtures such as baths, showers, dishwashers or clothes washers will be installed in the foreseeable future. Acceptance of a Class 1 and Class 2 sewage system to serve new construction should only be given if there is a suitable area on the property for the construction of a Class 4 or Class 6 sewage system, should one be required in the future under section 64 of The Act because of planned improvements to the building or the water supply system. This requirement should only be waived if the location of the lot and other factors make such future improvements improbable (e.g. no power). The Certificate of Approval authorizing a Class.2 sewage system to serve new construction should include statements which:

(i) Show the limitations of the approval such as "accepted for disposal of waste water from the kitchen sink and washroom hand basin only", or "accepted on the basis that no pressure water system is installed."
(ii) If only one suitable area exists for the future construction of a Class 4 or Class 6 sewage system, describe this area and require that it be reserved for that purpose.
(iii) Require the owner to make application for a new Certificate of Approval before any work is undertaken that will affect the operation or effectiveness of the Class 2 system, such as the addition of more bedrooms, improvements to the water system or additional connections of water using fixtures.

(iv) Require that the owner register the Certificate of Approval on title and forward to the approving Director a copy of the instrument with registration particulars.

(v) Require the owner not to sell the property on which the Class 2 system is located without including information on the above conditions in any offer of purchase or sale.

(d) Class 5 Sewage Systems - A holding tank should not be permitted as the sewage system to serve new construction, except where there is an acceptable Class 7 sewage system and disposal area available, and the Director can be satisfied that it is not possible to install a Class 4 or 6 sewage system on the lot with reasonable improvements. A Class 5 sewage system may be approved as a temporary disposal system where it is known that a sewer system will be constructed, or extended, to permit connection of the building served. An additional consideration would be the prevalence of holding tanks already in service in the vicinity and, in some circumstances, the municipality's willingness to ensure continued service should the established Class 7 sewage system cease operation.

CHAPTER 16
Reserved for
SURVEYS AND ABATEMENT PROGRAMS

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CHAPTER 17
Reserved for
COMPLAINTS

CHAPTER 18
Reserved for
ENFORCEMENT